INSULATING VARNISH PRODUCTION

The ELECTRICAL REVIEW

FOUNDED 1872

VOL. CXII No. 2886 [All Rights Reserved] MARCH 17, 1933 [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage] PRICE SIXPENCE

MAR 30 1933

"You should know"

Customer: "What about these cheap lamps I see advertised? Wouldn't it pay me to use them?"

Contractor: "No more than it would pay me to sell them. *You* would save a few pence in first cost, but would lose heavily on current consumption and lamp replacements. I might sell a few more lamps to begin with, but would quickly lose both the goodwill and the orders of customers to whom I had supplied low-grade, unreliable lamps."

Customer: "Well! *You* should know. I'll take Mazda Lamps again. They have always given excellent service."

Sell MAZDA LAMPS

WITH THE WONDERFUL NON-SAG FILAMENT.

B T-H

MADE IN ENGLAND ENTIRELY FROM BRITISH MATERIALS

3446

THE BRITISH THOMSON-HOUSTON CO., LTD.

CAPOSITE

The NEW Lagging for BETTER & CHEAPER HEAT INSULATION

EFFICIENT
DURABLE
ECONOMICAL
LIGHT IN WEIGHT
EASILY FITTED
EASILY REMOVED
NO POWDERY WASTE
BRITISH MADE

Write for illustrated booklet, samples and prices.

Caposite Sectional Lagging maintains maximum efficiency for the whole period of its service—and it outlasts the life of the plant to which it is fitted.

From 92% to 96% of bare pipe loss is saved by Caposite Sectional. This has been proved by independent tests.

Cape Asbestos Co. Limited
Morley House, 26-30, Holborn Viaduct, London E.C.1
Factory Barking, Essex

RW Co LTD

THREE CYLINDER 20,000 K.W. 3,000 R.P.M. TURBO ALTERNATOR

RICHARDSONS WESTGARTH-BROWN BOVERI
TURBINES & TURBO ALTERNATORS
ALSO
CONDENSERS, DEAERATORS, FEED-HEATERS
AND
WATER TUBE BOILERS.

Tel. No.: 2171 WEST HARTLEPOOL.
Telegrams: "RICHARDSONS" HARTLEPOOL.

RICHARDSONS, WESTGARTH & CO., LTD.,
HARTLEPOOL ENGINE WORKS,
HARTLEPOOL.

Mica Micanite

Insulators for every description of Electrical Work.

Superfine "MICAYLOR" Diaphragms for Sound Boxes.

Taylor & Petters, Ltd. 3/11, Westmoreland Place, City Road, N.1. Phone: Clerkenwell 4105 Telegs: Micaylor, London

We supply 2 Million Condenser Plates, Weekly to the Magneto & Wireless Trades.

We specialise in Cutting, Gauging, Machining

COPPER WIRE

Works: VALOUR WKS., CAMBRIDGE ARTERIAL RD., ENFIELD, MIDDLESEX

H.C. SOFT PLAIN, TINNED & HARD DRAWN FOR ALL USES

ELECTRICAL & CABLE MAKERS SUPPLIES

R. H. SYMONDS, LTD., 39, VICTORIA ST., WESTMINSTER, S.W.1

Telephones: VICTORIA 2321, 2322, & 2323. Telegrams: "FLATIRON, SOWEST, LONDON."

The
Electrical Review

VOL. CXII. MARCH, 17 1933. No. 2886

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
The Severn Tide	369
Insulating Varnish Production	372
Low-voltage Breakers. By V. A. Brown	373
Electrode Boilers in a Large Bus Garage	374
Power Cable Developments	376
The Severn Barrage Scheme	377
Domestic Apparatus at Leipzig. By Viola Ripley	378
Meetings and Discussions	379
Correspondence: A Queer Joint Box; Canvassers and Canvassing; Neon Sign Connections; A Call to Action; The "Juniors" Jubilee; On Their Doorsteps; Engineering Apprenticeship; Reactive Current; Distribution and the Small Undertaking; Shock Protection; Signs and the Times	382
New Apparatus and Devices	385
Parliamentary News	388
Business and Industrial Notes	389
Electricity Supply	393
Traction	394
Communications	395
Contract Information	396
Notes	397
Our Personal Column	398
New Companies Registered	399
Returns of Electrical Companies	399
City Notes	400
Stocks and Shares	401
Published Specifications	403
New Work for Contractors	404

The Severn Tide

THE production of electricity by water power has an imaginative appeal that is not likely to be lessened in the case of the Severn Barrage by the fact of its being the first large tidal scheme anywhere to hold out a promise of useful results. The report of the Moore-Brabazon Committee must be prevented from becoming the sport of considerations that have little relation to reality by keeping its practical bearing well to the fore.

The barrage, in its electrical aspects, should be regarded purely in its relation to the grid. The question is whether it will be more economic to send out to the national network some 1,600 million kWh per annum from water-power or coal-fired stations.

The findings of the Committee expose the fallacy of the popular view that water power costs nothing, and confirm the opinion expressed in these columns that no economy would result if the whole cost of the works were debited against the supply of electricity. Even after allocating a third of the expenditure to roadways, railways, and harbours, the intermittent nature of the supply would prevent its competing with coal.

By providing storage for pumped water, which would drive turbines under a constant head in an auxiliary station, the tidal plan approaches the normal water-power scheme, and a constant supply at all tides could be ensured. Electricity could be produced in this way, the Committee believes, at an overall cost of only two-thirds of that with a steam station of the Battersea type.

The Committee had to look far ahead, as the barrage would take fifteen years to construct, starting from 1937. Much more depends upon the accuracy of estimates of capital charges on water-power stations than those in which running costs form an appreciable proportion of the whole, and the unusually high allowance for contingencies (12½ per cent.) may not prove unduly conservative. The balance between water and steam might also be seriously disturbed by variations in the price of coal over the next twenty years. We take no account of possible discoveries that might revolutionise our methods of generation; we see none on the horizon, and if we wait on what might be we shall never make the most of the resources that we have.

Apart from the wide margin of saving in its favour, the adoption of the tidal scheme would reduce the difficulty that may be anticipated as time goes on in finding suitable sites (*i.e.*, with enough really cold water for condensing) for steam stations.

On technical grounds there seems to be a case for going ahead with the tidal scheme. Whether the expenditure on other items will be justified on economic, social, or industrial grounds is not for us to consider. As to the effect on the ultimate consumers, they would, no doubt, indirectly benefit by the reduction in generating costs, but probably to the extent of less than 5 per cent. of the total consumption that might be expected by the time the scheme was completed.

London Tariffs

THE annual statement of the London and Home Counties J.E.A. relating to the tariffs of ninety-one undertakings in the London District shows the position at the beginning of the year, and its usefulness is thus not impaired by lapse of time. Similar official particulars for the whole country are needed. As assisted wiring and hire schemes are needed to make good tariffs really effective, the value of the publication would be enhanced by brief details of these. Over fifty undertakings normally charge meter rents. Although these are justifiable they are unpopular, but their remission is not always regarded by consumers as equivalent to a substantial reduction in price (their abolition has cost the "Northmet" some £50,000 in annual revenue), but the resulting goodwill should have an indirect value. Eight undertakings offer domestic tariffs that include ½d. per kWh or less all the year round and five during the summer only; twenty-three others have similar low rates for space heating and

water heating. Eight undertakings charge 8d. per kWh and over for lighting, which may be dictated by circumstances. But the optimism of the twenty-five undertakings which expect to sell electricity for heating and cooking at from 2d. to over 4d. per kWh is surely worthy of a better cause.

A Good Word for E.D.A.

To-day the Council of the British Electrical Development Association will submit an exhaustive report of the high-pressure work done by the organisation during 1932. It will be considered at the annual meeting—always an informal sort of function—which follows the luncheon at the Savoy Hotel, at which the Hon. Oliver Stanley, the Minister of Transport, is to speak. It is stated that Lord Ashfield will succeed Lord Meston as president. Those who are at the heart of operations know how widespread and how varied E.D.A.'s activities are, but the onlooker and the outside critic can only get a true conception of what is being done if they sit down quietly and see the full range of operations run off rapidly on an imaginary film. Writing with our own close acquaintance with things, we have to combine our congratulations to the director, the business manager, and the staff, with sympathy for them on the strenuous life they have to live. Their strength, like that of the funds, might well be doubled, trebled or quadrupled, and even then, so great is the opportunity, much would still remain to be done.

County and "Nesco" Progress

Remarkable progress figures are recorded in the annual report of the County of London Electric Supply Company for 1932. The net capital expenditure has reached £17,000,000, so one would expect very big figures concerning energy consumed. Units sold numbered more than 604½ millions—an increase of 95 millions, while consumers have grown by 48,000 to 294,000. The County Company's areas, of course, are full of ever-increasing opportunities for business, and the future holds big things in store if it pursues a policy of encouraging domestic consumers to make full use of electricity for all purposes, as the report suggests. Very gratifying results have attended assisted wiring, hire, and hire-purchase schemes, and new showrooms and branch offices are being opened in many places—a policy which will be pursued more and more by most undertakings as service is extended to new, fairly populated areas. Very substantial advance is also recorded in the report of the North-Eastern Electric Supply Company. Connections to the system increased by 37,537 h.p. during 1932, bringing the total to 823,225 h.p., while the profit increased from £857,865 to £947,532. The transfer of its subsidiaries took place at September 30th last.

My Neighbour

We commend to the sympathetic consideration of all men in positions of electrical authority or responsibility—especially those who do not know from personal experience what it feels like to be out of employment—the letter of "C.E.E." which appears in our "Correspondence" pages to-day. The writer, whose record is known to us, issues "A Call for Action" on the part of those who have a desire to lighten the lot of many men of high technical and other qualifications who are feeling the effects of world economic depression; of the mistaken condemnation of expenditure on public and other works irrespective of whether they were revenue-producing or not; and/or of the changes that have come over electrical manufacturing requirements during the last year or two. Only gradual improvement of the situation can be expected until many millions of pounds of new electrical and telephone expenditure brings added activity to the industry. Better times will come as electricity supply is properly developed—that part of the work we can accelerate, but whatever is done in this or other directions to make work it lies within the power of many of our readers to play the part of neighbour in some way or other to those of their technical and administrative *confrères* who are unemployed, not because they are less efficient than their fellows, but through causes over which they, alone at any rate, have no control. What can our readers suggest to alleviate the position of these unfortunate men?

Electricity for Everything

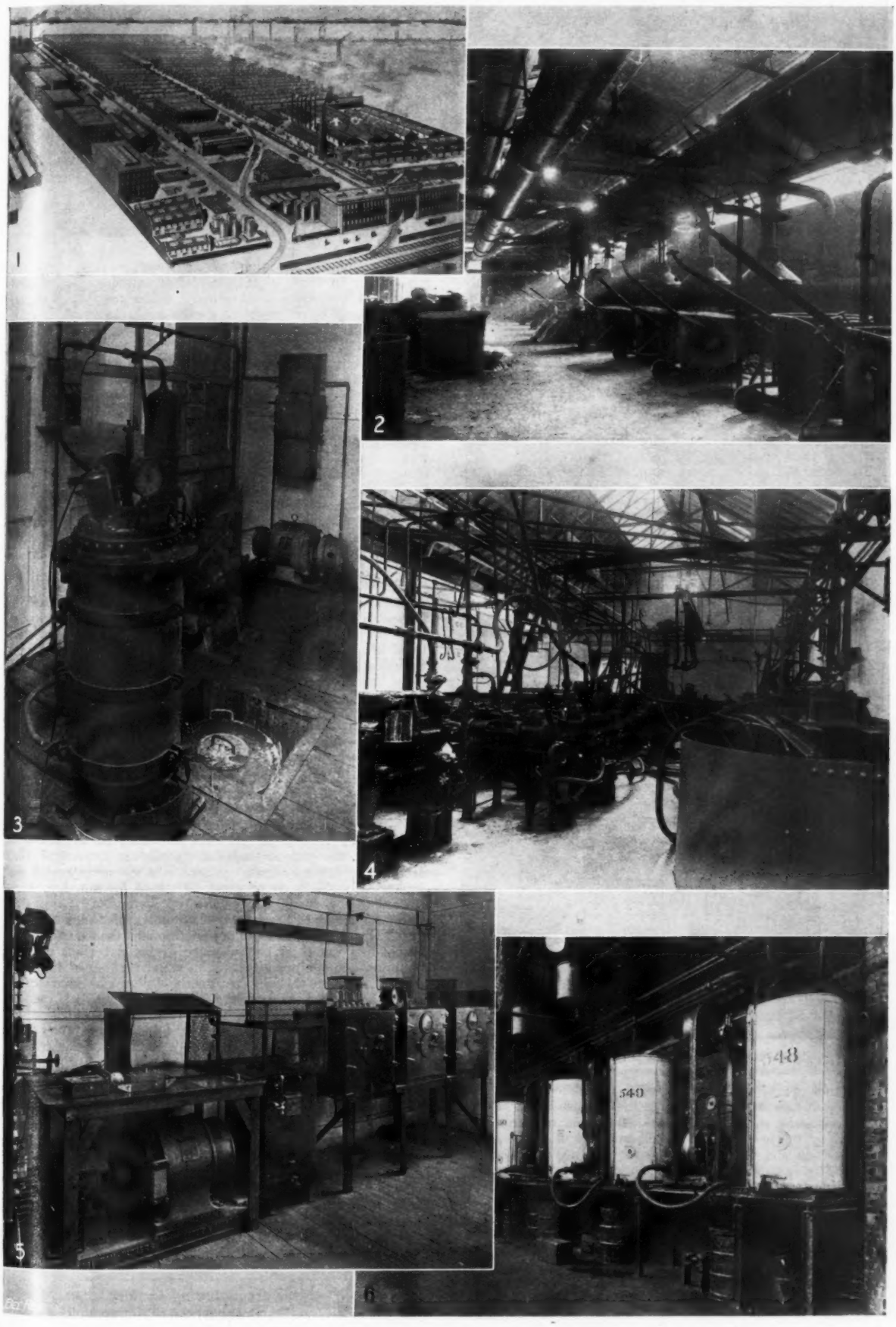
Colonel Crompton has discovered that the secret of perennial youth lies in the pursuit of electricity supply development. The Kensington and Knightsbridge Electric Lighting Company, of which he is chairman, found at the end of 1932 that 97 per cent. of the premises in the district were taking a supply. But nobody thinks of the word saturation nowadays until his consumers are using electricity for many household and business purposes besides lighting. A campaign to develop the general domestic load was therefore entered upon. Hiring charges were reduced, a more attractive tariff was introduced, a publicity plan was conducted throughout the area, and new showrooms were opened for demonstrating every kind of electrical apparatus. At the meeting last week the chairman was able to report that, as a result of the effort, the number of electric cookers on circuit increased by 80 per cent., while the number of water heaters was trebled during 1932. Optimistic as ever, he is confident that the enterprising policy now in force will bring the reward of a great expansion in the future. That 97 per cent. is not the end; really, it is only the beginning! May the progressive Colonel some day be able to tell his shareholders that as many as 97 per cent. of the premises are using electricity for every domestic purpose for which it is so admirably adapted.

The Brighton Explosion

The damage at Southwick power station last Saturday was fortunately more spectacular than material. An explosion of pulverised coal burst the steel plates of the bin and wrecked some of the pipework conveying the fuel to one of the two boilers; beyond that the destruction was confined mainly to the glazing. The second boiler with its pulverising plant was unaffected, and continued to carry its load, the electricity supply continuing. Mr. Clinch, the borough electrical engineer, tells us, as we go to press, that he has formed no definite conclusions yet as to the reason for the explosion. Seventeen of the largest stations in this country use pulverised coal, and last year at Brighton 30,000 tons was burned on this system, and freedom from trouble of this kind over many years demonstrates the reliability of the method. There is no reason to doubt that investigations will show that, whether the cause was spontaneous combustion, local excess temperature, or something else, a repetition can be prevented.

Old Lamps for New

Recent cases of leading lamp makers taking action against dealers selling old lamps in new cartons may have led our readers to wonder where these used lamps come from. Light is thrown on the matter by correspondence between the E.L.M.A. and the I.M.E.A. reproduced in the latter's current *Journal*. It appears that, to encourage voltage standardisation, E.L.M.A. members have been offering 230-V lamps at special rates to undertakings effecting a change of voltage. The replaced lamps in some cases have been sold to dealers, packed for convenience in the cartons which were supplied with the new lamps, and this practice has led to frauds on the public. To combat this E.L.M.A. offers 1d. for every such lamp removed and destroyed in the course of change-over work and replaced by an E.L.M.A. lamp.



Messrs. Pinchin, Johnson & Co.'s Works at Silvertown

(1) A general view of the factories. (2) A line of gum-melting pots. (3) Miniature vacuum and pressure impregnation plant. (4) Press-type filtering equipment. (5) Electrical testing equipment with ovens on the right. (6) Some of the thinning-room tanks

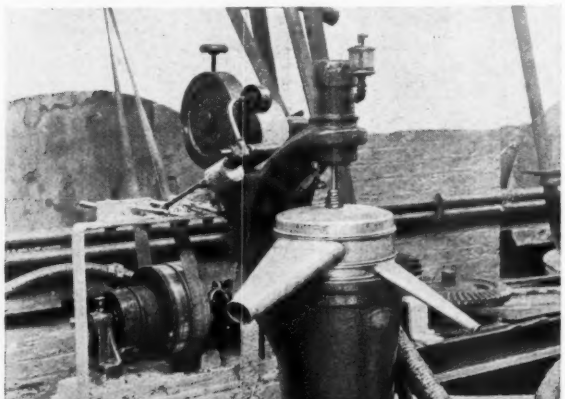
D

INSULATING VARNISH PRODUCTION

BROADLY there are two main groups of varnishes, those which depend on the evaporation of the solvents only for drying, and those which dry mainly by oxidation or polymerisation. The production of the first group (spirit) involves the solution of the particular gums or resins in suitable solvents in revolving wooden churns, the speeds of which are adjusted to suit the varying mixtures. From the churns the material passes to wooden settling vats from which it is drawn off and finally clarified by centrifugal treatment before despatching. Such varnishes are made from shellacs, manilla copal and certain synthetic resins. Varnishes in the second group are made from either natural resins, synthetic resins, or from asphaltums, bitumen, pitches, &c.

To render the natural resins completely soluble in oils they are subjected to "running" or "cracking," *i.e.*, heating in metal containers over below-ground furnaces. The containers or pots are carried to and from the furnaces cradled in wheeled trucks. Successful production depends very greatly on the skill of the gum runner in determining the exact point at which to stop the heat treatment of the gum or oils.

The oils used are in some cases subjected to heat treatment by which polymerisation or oxidation takes place. In certain cases oil is heated in set pots of about 1,500-gal. capacity at various temperatures, in such a way as to exclude air, while



A centrifuge filter

sometimes the oil is heated exposed to the atmosphere according to the ultimate use to which the varnish is to be put. Air blowing assists the removal of deleterious volatile matter created by the heating. The total exclusion of air results in no oxidation and very little breakdown of the oil. The products of each of these methods have certain advantages over the others for specific purposes.

Drying and Thinning

After the amalgamation of the oil and gum, and subsequent heating, to obtain the desired viscosity, various drying agents are added, these acting essentially in a catalytic manner in the production of the dried film. Varnish bases so produced are then thinned with turpentine, white spirits or similar solvents. From the thinning rooms the varnishes are pumped to preliminary storage tanks for the settling of extraneous matter. The varnish is next passed through press-type filters or centrifuges before being further stored for maturing, after which it is refiltered and then packed for despatch. Each of the various types of synthetic resins require special treatment before the actual varnish making processes are commenced, but generally no "cracking" is necessary, and the processes are similar to those already described, although sometimes the use of autoclaves is involved. Black resins (industrial residues, such as pitches, &c.) are subjected to sweating processes similar to the "running" of the natural resins, and the completion of the varnish follows the same general lines.

Although the general processes described would serve for all varnishes, insulating varnishes depend primarily for their special properties on the careful selection and special pretreatment of the raw materials. It is essential to secure uniformity in such physical properties as specific gravity, viscosity, drying time, dielectric strength, and moisture and transformer-oil resistance, and to ensure the absence of any material which is likely to have a corrosive effect on metals. One reason why it is so essential to ensure uniformity is that many industrial users purchase their varnishes in a more concentrated form than that at which they are actually used, and thin them down themselves to suit their own requirements. The selection of the correct type of thinner is essential.

Testing Equipment

For the information contained herein we are indebted to Messrs. Pinchin, Johnson & Co., Ltd., to whose works at Silvertown we recently paid a visit. For conducting electrical breakdown tests to satisfy the various British Standard Specifications and to secure high quality production, the company has installed a complete electrical equipment supplied by the Metropolitan-Vickers Electrical Co., Ltd., embracing a 5-kVA 400-V motor-generator set working in conjunction with a M.V. 400/25,000-V single-phase transformer with one terminal earthed. The other (h.p.) terminal serves a bus-bar and in turn a terminal in each of three electrically-heated ovens and a special testing bench with fixed and movable brackets. The testing voltage is varied by directly altering the alternator voltage by a potentiometer resistance in its field. A d.c. contactor controls the alternator field and is governed by trips in circuit with interlocks on the doors of the ovens, the cage around the transformer head, and that around the testing bench. There is a specially wound oil-immersed variable shunt ratio resistance for the h.p. voltmeter.

For the standard breakdown tests the varnish films are produced by passing tissue paper through the varnish and suspending the sheet one way for drying a certain number of times, and the opposite way an equal number of times, so getting the film thickness as nearly uniform as possible. A particularly interesting feature is a small M.A.X.E.I. vacuum and pressure impregnation plant with special provision for solvent evaporation. A fan circulates the air and fumes from the impregnation chamber through a condenser in which the fumes are distilled, the same air being returned to the chamber, so that there is no oxidation and the air is perfectly dry all the time.

Electricity is used extensively in the processes, mainly for pumping the liquids to and from the various pots and tanks, and also in connection with the fume-condensation plant. Dense fumes are given off from the gum and oils in the pots during heating, and are removed by fans through a trunk system in which the fumes meet jets of cooling water, thereby being condensed. The resulting solids are carried along the trunks to separating tanks. About 98 per cent. of the "wastes" are recovered from the condensate and are of commercial value.

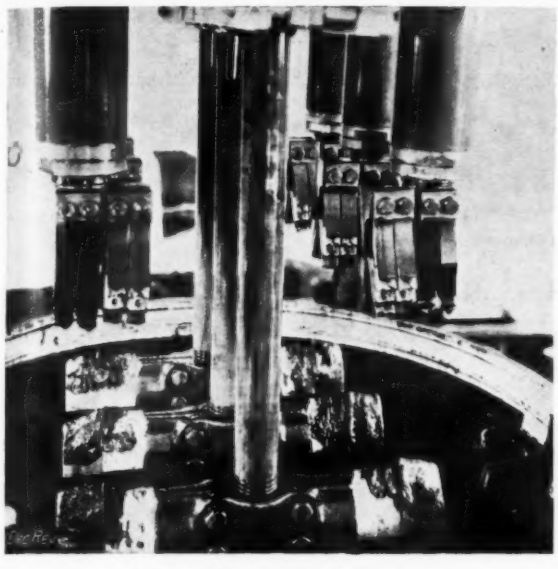
Mine Overwinding Inquiry

The Mines Department announces that a committee of six has been set up to inquire into the precautions against overwinding which are, or could be, taken when persons are raised or lowered in mine shafts and to make recommendations. The secretary to the Committee is Mr. J. E. Henshaw, and communications for the committee should be addressed to him at the Mines Department, Cromwell House, Dean Stanley Street, S.W.1.

Low-voltage Breakers. By V. A. Brown, B.Sc.(Tech.),

Heavy short-circuit stresses at small breaking capacities

THE increased capacity of transforming plant required for low-voltage supplies to large power station auxiliaries, &c., has created a demand for 440-V oil circuit breakers having interrupting capacities up to 50,000kVA. A circuit breaker must be able to make and break the maximum short-circuit current that can flow through it in the event of a



Effect of arc current on contacts

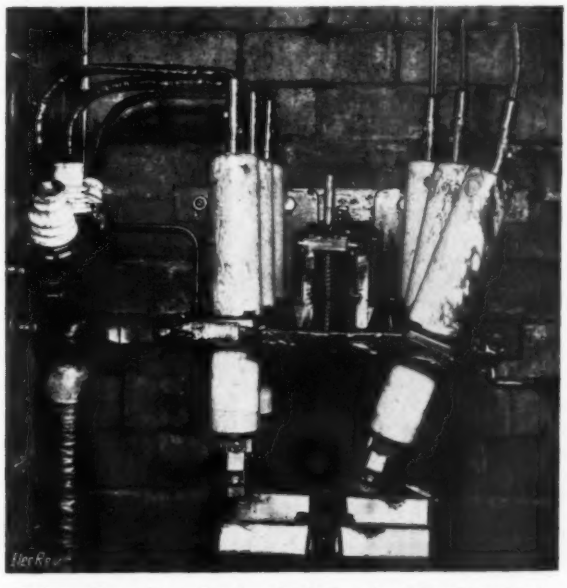
short-circuit on the system. The interrupting performance is usually measured in terms of kVA, the value of which is calculated from the current broken and the rated line or recovery voltage, which is arbitrary.

Failure to recognise the high values of short-circuit current, against which a breaker may have to be closed, has been due to the long-established method of choosing and rating circuit breakers on a kVA basis. It has caused much confusion, and, consequently, there are wide variations in the size and price of low-voltage breakers offered for a definite breaking capacity. The maximum rating, listed in B.S.S.116 (1929) for the 660-V class of circuit breaker, is 100,000 kVA and, occasionally, this rating has been specified in inquiries for 440-V switchgear. In many cases, such ratings as 75,000 and 100,000 kVA have been chosen arbitrarily without careful calculation of the possible short-circuit current. The short-circuit kVA to be interrupted on a 440-V circuit should not be allowed to exceed 50,000 and, in future editions of B.S.S.116, the maximum breaking capacity rating, in the low-voltage list, should be reduced to this figure.

Short-circuit Stresses

Internal pressure, due to gas formation, is not a serious factor in the design of low-voltage breakers; short-circuit current is the dominant factor. The making current is expressed as the peak value of the first major half-cycle of short-circuit current; the values of making current shown in the upper curve are for the case where low-voltage supply is obtained through step-down transformers from a high-voltage generating station. The total reactance of the generating plant and step-down transformers has been taken as 100 per cent. For other circuit conditions the initial short-circuit current values will differ from those on the curve due to the difference in decrement. It is the making current that produces the heaviest stress. The terminals and moving contacts experience a distributed repulsive force, and in addition a distributed downward " throw-off " force is applied to the moving contact bars. These electro-magnetic forces are in the nature of intermittent hammer blows whose intensity diminishes with time due to current decrement.

Electromagnetic force values are given in the accompanying curves for a range of from 15,000 to 50,000 kVA for definite 440-V circuit breakers. The curves show that the maximum



Deformation of breaker terminals by short-circuit current

peak value of force increases rapidly above 15,000 kVA and indicate the importance of the mechanical design of such breakers. The three sizes of 440-V breakers listed in Table I are subject to nearly the same electromagnetic stresses as the corresponding 6,600-V breakers in the second column and require the same size of arcing contacts.

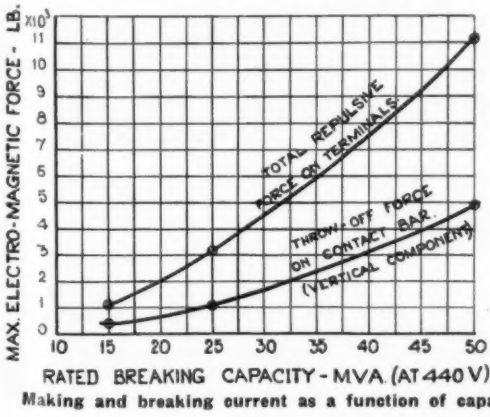
TABLE I.

Comparison of breaking capacities for approximately equal electromagnetic stresses (3 phase) and size of arcing contacts.

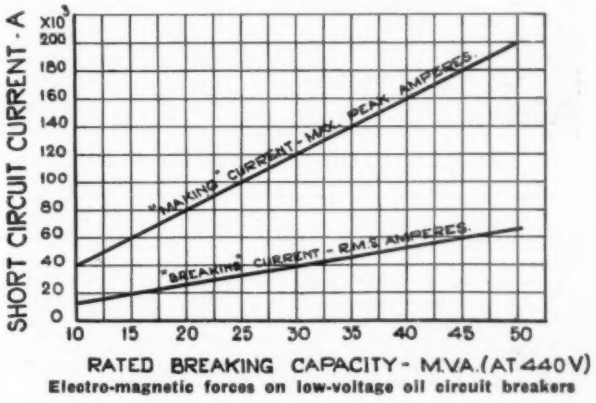
440-V Breakers.	6,600-V Breakers.
15,000 kVA	250,000 kVA
25,000 kVA	350,000 kVA
50,000 kVA	750,000 kVA

Unlike the stresses due to internal gas and oil pressure, the electromagnetic stresses are constant at a given value of short-circuit current for a definite breaker; hence a small number of short-circuit making capacity tests are sufficient to prove the design.

In addition to the stresses set up by the making current on the current-carrying parts of the breaker, the stresses applied to the operating mechanism and contacts have to be carefully considered. There is always a time interval between



Making and breaking current as a function of capacity



Electro-magnetic forces on low-voltage oil circuit breakers

the making of the short-circuit and the mechanical tripping of the circuit breaker due to the time delay in the protective relay and trip coil. The solenoid mechanism must develop enough power to make adequate area of contact and compression of the kick-off springs before the closing movement is reversed by mechanical tripping of the breaker; otherwise the breaker may weld-in. When short-circuit current is established between the arcing contacts, a local force, due to the magnetic field and gas pressure, is produced at the contacts. Unless the arcing contacts are sufficiently robust and subdivided, this force may prevent the establishment of adequate contact.

In the illustration showing the effect of electromagnetic stresses on the current carrying parts of a small 6,600-V oil-immersed isolating switch, which was called upon to carry short-circuit current in excess of its rating, the initial inrush was estimated to be 32,000 A (peak), whereas the switch is rated to carry inrush currents up to 20,000 A (peak) only. The breaker in the photograph indicating the deleterious effect of arc current on the contacts was closed against a current of 117,000 A (peak). The spread of burning from the arcing contacts to the main contacts was due to the large number of tests carried out without the contacts being given any attention whatever. A series of eleven tests was conducted. In five tests the current exceeded 50,000 A and in three it exceeded 100,000 A. The remaining tests were carried out at currents below 50,000 A. The thermal capacity of the current capacity parts also has to be considered and for each breaking capacity rating there is a minimum normal-current rating that can be employed. This rating is settled, in many cases, by mechanical strength as well as thermal capacity depending on the type of construction.

Purchasers will observe from the above notes that low-voltage breakers, even for small values of rupturing capacity, demand careful design and testing to ensure that they can deal with the worst service conditions. In inquiries for oil circuit breakers, the making capacity (peak amperes) should be specified or, alternatively, sufficient data should be given from which the initial short-circuit current may be calculated. Acknowledgments are due to Messrs. Ferguson, Pailin, Ltd., for permission to publish data and the illustrations which accompany this article.

Electrode Boilers in a Large Bus Garage

THE new Knightswood omnibus garage at Glasgow has much of electrical interest, mainly on account of the heating installation.

It will accommodate two hundred double-decker buses, with ample space for manœuvring, and there is an office block with, *inter alia*, a recreation hall with accommodation for four hundred employés.

For the garage proper there are two 6,600-V 1,000-kW Bastian-Reyrolle boilers arranged for off-peak working in conjunction with four 3,500-gal. hot-water thermal-storage cylinders. The hot water is circulated through a mixing valve at a constant flow temperature, independent of the temperature variation in the storage vessel, through heating batteries in the main and subsidiary air trunks, while large centrifugal fans circulate the air over the heating batteries and through the duct-work system to the garage. Other extraction fans remove the air from the garage, and it can be recirculated through the heating battery, or fresh air can be supplied, or the recirculated and fresh air can be combined. Filters are provided to cleanse the air.

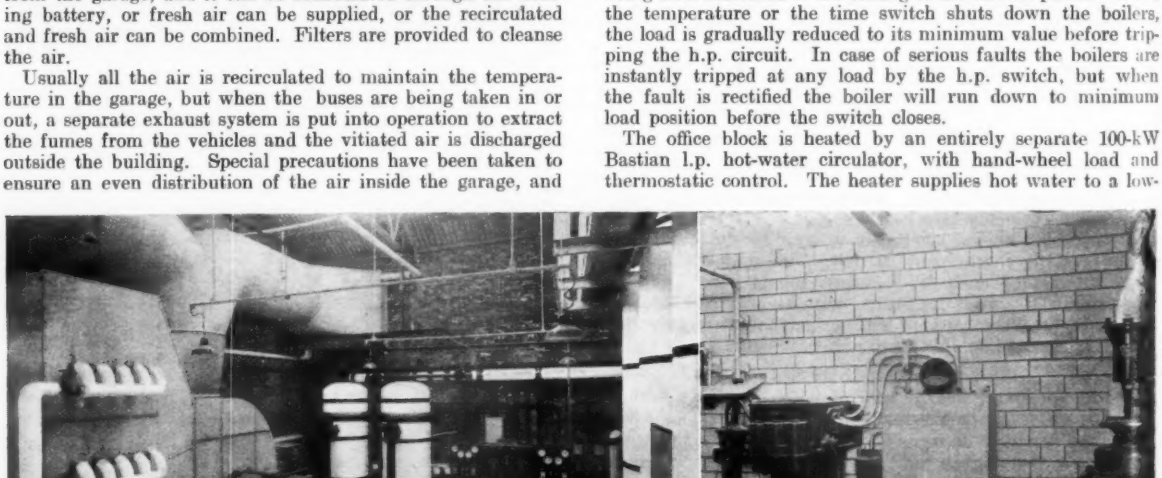
Usually all the air is recirculated to maintain the temperature in the garage, but when the buses are being taken in or out, a separate exhaust system is put into operation to extract the fumes from the vehicles and the vitiated air is discharged outside the building. Special precautions have been taken to ensure an even distribution of the air inside the garage, and a uniform temperature can be maintained, but when the buses are starting up the fumes are extracted before they have a chance to spread through and vitiate the whole of the atmosphere.

By unbolting the head of the boilers, the top section can be lifted clear to the travelling block above, and the whole of the interior of the boilers, the electrodes, and the load control mechanism can be inspected without disturbing the electrical or main water connection. The main control equipment includes duplicate automatic starters for the primary and secondary circulating pumps, altitude gauges showing the pressure in the four storage vessels, distance thermometers indicating the temperatures in each storage vessel, hand switches for selecting the various pumps and boilers and also for changing over from automatic to manual control, an electrically wound time switch governing the off-peak supply, and electrical boiler controls.

Each boiler has a load selector, graduated from 50 to 100 per cent. full load, control circuit fuses, automatic reversing starters for the load control motor on the boiler, a watt-hour type load control relay, and two auxiliary relays for selective operation and fault protection.

There is protection against overload or earth leakage at the boiler, complete or phase failure of the supply, excessive temperature in the boiler, and failure of the primary circulating pump. Further, the control gear is so arranged that the boilers can only be switched on at minimum load, the load being then increased to the setting of the control panel. When the temperature or the time switch shuts down the boilers, the load is gradually reduced to its minimum value before tripping the h.p. circuit. In case of serious faults the boilers are instantly tripped at any load by the h.p. switch, but when the fault is rectified the boiler will run down to minimum load position before the switch closes.

The office block is heated by an entirely separate 100-kW Bastian l.p. hot-water circulator, with hand-wheel load and thermostatic control. The heater supplies hot water to a low-pressure hot-water radiator system, with accelerated circulation. The domestic hot water is supplied by a separate storage cylinder fitted with electric heaters, also thermostatically controlled.



The main electrode-boilers at the Knightswood Garage, Glasgow, and (right) the 100-kW circulator for the office block

The whole installation was carried out by Messrs. James Combe & Son, Ltd., for Mr. L. McKinnon, general manager of the Glasgow Transport Department. The high-pressure electrode boilers were manufactured by Messrs. A. Reyrolle & Co., Ltd., and supplied by Messrs. Bastian & Allen, Ltd., who also manufactured the l.p. electrode heater and supervised the complete control scheme.

Some Municipal Electrical Engineers

From left to right: Mr. D. McDougall, Greenock (*Elliott & Fry*); Mr. W. D. Brassington, Motherwell; Mr. W. C. Roy, Wick; and Mr. J. Alex. Bell, Aberdeen

Electricity Supply in Spain

UNDER a law of 1924, the Spanish communes were given monopolistic rights in electrical development, but operation was left to private enterprise subject to public participation and control. Since 1926 the scheme for a national high-voltage network has been pursued, and, in 1929, a Power Board was formed with representatives of the government irrigation authorities, electricity supply and electro-technical industries to deal with water-power development, interconnection and centralisation. In the same year the Government decreed the formation of a syndicate of electricity producers, embodying all hydro-electric undertakings, with a capital of 600 million pesetas (about £14,500,000), but the subsequent trend of events held up the intended developments. Financial stringency has retarded the development of hydro-electric resources; and the restriction of foreign interests in new electricity undertakings to 25 per cent. is an obstacle to the participation of foreign capital.

The total production of electrical energy is about 3,000 million kWh per annum and, in June, 1931, there were 295 hydro-electric stations in Spain, with a capacity of 800,000 kW, and 109 thermal stations (350,000 kW). The total electrical power developed is thus about 1,500,000 h.p., of which 1,000,000 h.p. is hydro-electric (about one-quarter of the total continuous water-power available); of this, 445,000 h.p. is developed in the six large stations of Lafortunada, Milares, Camaras, Leros, Tremp and Capdella.

Most of the water-power is in the northern part of the peninsula, and its development is closely associated with irrigation problems. Owing largely to mountain ranges, which impede the construction of a national network, electrical development at present is characterised by a number of local networks, as detailed in an article by Dr. Bruno Kiesewetter in *Elektrotechnische Zeitschrift*, on which the present notes are based.

The Principal Undertakings

The water-power resources of the Ebro district are the most important in Spain and are estimated at 2,300,000 kW. The most prominent electricity undertaking is the Barcelona Traction Light and Power Co. which, with its associated concerns, has established a power network in north-eastern Spain extending from Sastago to Tortosa on the coast, and along the Pyrenees as far as Cledes, including about 340 towns and villages with a population of 2,600,000 or about one-eighth of the total population of the country. The energy sold rose from 624.2 million kWh in 1928 to 759.2 million kWh in 1931, the connected load rising during the same period from 94,042 to 108,693 kW for lighting, and from 242,830 to 278,511 kW for power, due largely to railway electrification.

The western part of the Ebro plain is served by the S.A. Hidraulica Moncayo, which has materially extended its equipment and resources during recent years. In the northern section of the province of Huesca, the electro-chemical firm Energia e Industrias Aragonesas S.A., Madrid, has an output of about 100 million kWh per annum; and the Sociedad Fuerza Electricas de Navarra operates stations for a network extending from Logroño to Olazgutia and Tolosa.

The Hidroelectrica Iberica S.A., Bilbao, connects the western Ebro district with the north-west of Spain, and operates the largest Spanish hydro-electric plant, the Lafortunada (Huesca) station of 125,000 h.p. This company and its associated undertakings have great possibilities in and around the industrial district of Bilbao. Similar opportunities exist in the colliery and industrial district of Asturias, where the Electra del Viesgo, Santander, utilises the falls of the Navia in conjunction with stations at Ujo and Santa Cruz through a 62-mile 130-kV line. Though the cost of auxiliary stations is at present a serious consideration, the framework of an extensive industrial system is being formed. The north-western province of Galicia is served by the Sociedad General Gallega de Electricidad and the Fabricas Coruñesas de Gas y Electricidad, in which the former is strongly interested. The Gallega concern sold 41.2 million kWh in 1930, compared with 34.6 million kWh in 1929, and important associations of interests have been effected during recent years. Spanish interests in the Portuguese Lima and Portuguesa concerns should assist materially the rational development of resources in this district.

Prospects in Central Spain

The water-power of the Duero district estimated at 600,000 kW is being developed by the Sociedad Hispano Portuguesa de Transportes Electricas-Saltos del Duero S.A. This concern, with its associates, has an important field for development on both sides of the Duero, both northward towards the coast and south to Madrid and its environs. The interests of the Saltos del Duero in the Electra de Caceres extend its supply area to the Tajo and offer the possibility of ultimate connection with the network of the Sociedad Sevillana de Electricidad. The Saltos del Alberche, with an ultimate capacity of 150,000 kW, is already serving Madrid in conjunction with the Electrica Industrial, and as part of the Unión Eléctrica Madrileña. The supply to Madrid is further secured by the S.A. Hidroelectrica del Oeste de España from the northern tributaries of the Tajo.

The predominant electricity company of Central Spain is the Sociedad Hidroelectrica Española, with an output (in 1930) of 315 million kWh. With a distribution network extending from Castellon to Cartagena and Madrid, and with interests in the Portuguese companies and in the co-ordinated supply and distribution systems of Madrid, the Hidroelectrica Española will obviously constitute one of the main portions of the grid that is being built up. The Regadios y Energia de Valencia S.A. (Reva) utilises the River Turia for power and irrigation, and controls a number of subsidiary generating and distributing companies; a total of about 106,000 h.p. is available at five sites, and projected stations should generate about 200 million kWh per annum.

An important supply area with largely centralised generation is controlled by the Cia An. Mengemor and the Cia Sevillana de Electricidad. Of these, the Mengemor concern embodies five companies with twenty-three water-power stations. There are also the thermal stations and network of the Sociedad Minera y Metalurgica de Peñarroya, and those of the Canalización y Fuerzas del Guadalquivir which, with existing and practicable interconnections, provide an extensive network capable of further important development. In 1930, the sales of the Mengemor company amounted to nearly 81 million kWh. The Sevillana concern has a network extending from Algericas and Cadiz through the Huelva copper region to Badajoz and Merida, with a 114-mile, 70-kV line from the Cala and Llerna stations to the province of Badajoz, and with various interconnections in being or under consideration; the output of this company was 120 million kWh in 1931 (128 million kWh in 1930).

Power Cable Developments

DURING the discussion last week at the Institution of Electrical Engineers on the paper on "Ionisation in Cable Dielectrics," by Mr. P. Dunsheath (W. T. Henley's Telegraph Works Co., Ltd.), reference was made to recent modifications in cable design and to condenser-type terminals.

When a solid cable heats up under load its ingredients, particularly the impregnating compound, expand and tend to move outwards, being re-absorbed when the cable cools. Without provision for such expansion, considerable internal stresses are set up in the dielectric. Two methods of improving the elastic response of solid cable were described by speakers.

Mr. P. V. Hunter (Callender's Cable & Construction Co., Ltd.) said that a very promising expedient was to make the core (conductor and insulation) oval in shape, fig. 1, and enclose it in a circular lead sheath, the space between being filled with compound. Tests were in progress with 66-kV single-core cables with 0.65 in. thick dielectric, and three-core cable with 0.5 in. of dielectric, subjected to 50 per cent. excess voltage, corresponding to a stress of 94 kV per cm. An internal hydraulic pressure of 50 lb. per sq. in. was usual in a circular solid cable, but in their oval type they had failed to measure 5 lb.

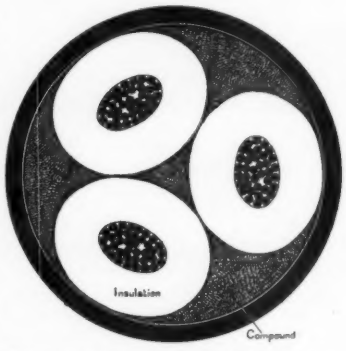


Fig. 1.—A three-core 66-kV oval conductor cable

The minor axis of an oval cable increases with increasing load and the major axis diminishes slightly; the net result is an increase of volume. These changes of dimension follow closely the change of load, *i.e.*, temperature. In a circular cable the shape cannot be disturbed and increased volume can only be obtained by exerting a hoop stress in the papers. As a result high hydraulic pressures are produced in the mass of the dielectric, and there is a tendency for compound gradually to slip past the papers. This compound does not return readily on cooling, and results therefore in the production of a void.

This effect does not take place in an oval cable, and there appears to be no theoretical or practical reason why, with the effects of expansion taken care of, the solid-filled cable should not work at electrical stresses equal to those customary with oil-filled cables.

Compressible-gas Cable

Mr. C. J. Beaver (W. T. Glover & Co., Ltd.) remarked on the somewhat paradoxical fact that the nearer the manufacturer got to freedom from ionisation conditions in the original cable the greater would be its liability to produce ionisable

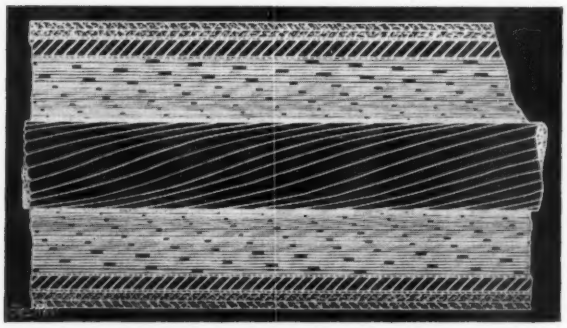


Fig. 2.—A compressible-gas cable

voids under working conditions, by reason of the lack of compressibility of the dielectric.

There is thus a physical necessity of providing for compressibility at constant volume within the cable. This can be done by substituting a proportion of gas for existing materials. The stranded conductor is sheathed to form a smooth surface on to which to wind the insulating paper, which is impregnated before application with a compound that remains "solid" at the highest temperature the cable is likely to reach. Another sheath is applied over the paper, and the gas is then introduced, finding accommodation in the spaces left by the convolutions of the paper wrapping as indicated in fig. 2.

A 66-kV cable of this type is at present under test and can be stressed to 140 kV per cm. It is claimed to negative completely all the bugbears catalogued in Mr. P. Dunsheath's paper. For example, this construction is entirely independent of the density of paper, or the effects of viscosity of the impregnating compound. There can be no void formation by distension of the lead sheath, because internal expansion is accommodated at constant volume by the compressible gas.

There is no movement of compound radially or longitudinally on heating and cooling, and the gas cable is independent of the rate of heating and cooling. Heating cycles produce no alteration of the power factor/voltage curve (which remains perfectly flat) up to the voltage value which is definitely predetermined by the conditions of the film dimensions and the pressure of the gas. Twice working voltage is well within practical range for this ionisation voltage. No physical modification of the gas spaces can occur, or interaction of gas and compound, because ionisation is absent; there are no time effects on power factor values with voltage; no variation of internal pressure from place to place; and no low pressure critical point due to temperature.

The gas cable is independent of gradient, and can be run to any height vertically. It is independent of thermal transients and has a greater current carrying capacity, because of its complete physical stability. The dielectric loss is all "pure" loss, and the risk of deterioration by ionisation has been eliminated.

Gas cable is applicable to any required voltage. Its thermal resistivity is comparable with that of ordinary cable, and its temperature gradient is therefore good. No external apparatus is necessary; the cable is simply charged up to the desired pressure and sealed off. Joints and terminal arrangements are simple and, on the basis of conductor size, a gas cable should be cheaper than any existing type.

Power cable "terminal breakdowns" are due to capacity-resistance linkage effects. A device for rectifying this field distortion and grading the longitudinal voltage distribution at cable terminations and joints to the required linear relationship is being produced by Standard Telephones & Cables, Ltd., commercially which applies the condenser grading principle simply and effectively.

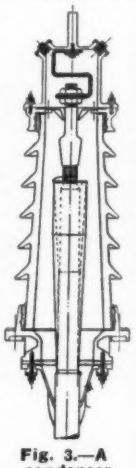


Fig. 3.—A condenser cone in a terminal

Condenser Cones

For instance, the flashover (wet) value of the porcelain sealing bell itself is sufficiently high, but the breakdown voltage of the termination is appreciably reduced by the introduction of the cable into the bell. When a condenser cone is fitted (as shown in fig. 3) this weakness is eliminated. Similarly, in service, slow charring or deterioration of the cable in the region of the sheath is frequently experienced, especially on systems working at over 60 kV, due to the longitudinal concentration of stress. Increase of insulation thickness in this region may mask the inherent weakness, but the simplest and safest protective measure is the elimination of field distortion.

In the termination in a sealing bell illustrated in fig. 3, in which the height of the porcelain is 15 in. and the cable insulation from sheath to conductor is only 10 in., the termination has continued working under normal service conditions for a period of nine months at a pressure of 83 kV (three-phase). Since this termination is of dimensions usually employed for 33 kV, it can be claimed that this performance is satisfactory. For 66 kV without cones the dimensions usually employed would be approximately 27 in. porcelain and 25 in. exposed cable insulation. For 80 kV without cones the dimensions would be a minimum of 30 in. in each case.

Barrier or baffle joints include a small diameter porcelain insulator fitting fairly closely to the cable. When condenser cones are employed in such a joint the test performance of the joint is considerably enhanced. In the case of a 33 kV joint (20 kV single-phase working voltage) test pressures of the order of 80 kV (single-phase) produced no apparent deterioration in the insulation, even when applied for very long periods.

Condenser cones may be included in ordinary straight-through joints with a view to the reduction of overall dimensions and acceleration of the joint assembly, thus reducing the time during which the cable ends are exposed to atmosphere. Even more remarkable results have been obtained in factory tests on cables insulated with impregnated paper. This ex-

pensive proposition in termination technique is much simplified by the application of the condenser cone. If a 50 in. long cone be applied over the sheath so that 25 in. of exposed cable insulation is put under electrical stress, voltages of approximately 275 kV may be achieved. The preparation of the two ends occupies about thirty minutes and only semi-skilled labour is required; 300 kV appears to be about the limiting voltage of a cone in air owing to ionisation of the surrounding air, but at the expense of fitting up in oil within a sealing bell this voltage may be exceeded. At 33 kV cable test pressures (*e.g.*, 53 kV single-phase) the condenser cone permits of the test end being reduced to 8 in., which represents an appreciable saving in scrap cable in a large order. For dielectric loss measurements on short samples, not only does such a cone redistribute the field at the ends of the sample but it can act as a guard ring, by this means rendering it possible to take very accurate measurements upon lengths of cable amounting to only a few feet.

The Severn Barrage Scheme

The report of the Committee of the Economic Advisory Council

THE Severn Barrage Committee was set up in October, 1925, under the chairmanship of Lt.-Col. J. T. C. Moore-Brabazon, M.P., "to inquire into and report upon the practicability of a Severn barrage." Among its members were Sir John Snell (chairman, Electricity Commission), who acted as chairman of the expert co-ordinating subcommittee carrying out the detailed supervision of the investigations, Professor Gibson, Sir Basil Mott and Sir Frank E. Smith. Messrs. Coode, Wilson, Mitchell and Vaughan-Lee were appointed consulting engineers. The final report of the Committee was issued as we went to press last week and was then referred to in our leading columns.

The best site for the barrage is stated to be at English Stones, where seventy-two turbines would be installed, each with a maximum output at spring tides of 17,000 b.h.p., sixty-seven being always available for use. Excavation would be carried to — 8 ft. O.D.; high water level in the basin at Beachley varies from 12.5 to 23 ft. The output per tide in kWh would be: spring, 4,680,000; mean, 3,190,000; neap, 1,300,000. As there are 706 tides in a year the potential annual output would be 2,252 million kWh, 2 per cent. of which would be required for auxiliaries, &c. It would be necessary to block the Shoots (1,200 ft. wide), and to construct an embankment dam with an overall length of 4,000 ft., a turbine dam of 4,550 ft., and a sluice dam of 6,825 ft.

The cost of the works is estimated at £37,726,749, of which £25,457,500 is debited against the electrical scheme. These figures allow for the capitalisation of interest, compounded at 4 per cent. per annum (on the assumption of a Government guarantee), over the fifteen years (from 1937) which has been allowed for the completion of the undertaking.

The average cost of energy sent out would be 0.18d. per kWh, but as the supply would be intermittent, steam pressure would have to be maintained at the existing coal-fired stations, so that the value of the water power would depend only on the saving in coal. In 1930 the amount of coal per kWh sent out from stations generating more than five million kWh per annum (allowing 6¼ per cent. for banking losses) was 1.75 lb., the cost of which was 0.1063d. per kWh at 11s. 4d. per ton (in the Midlands) and 0.1688d at 18s. (in South-Eastern and Southern districts). An improvement on these figures can be expected when the grid is fully in commission, and therefore water power could not compete with coal.

A Secondary Station

The effect on this comparison of constructing a secondary storage station at Trellek Grange on the Wye (8¼ miles north of Beachley Point, where the river joins the Severn) was investigated. The barrage plant would pump water to a reservoir covering about 750 acres, giving an effective head of 440 ft. at a secondary hydro-electric plant, the total energy stored between 400 and 500 ft. above O.D. being 26,910,000 h.p.-hrs. The cost of the secondary station is estimated at £11,468,901 (including 4 per cent. compound interest); its construction would enable a 24-hour supply of electricity to be maintained at all tides and the steadiness of output would considerably reduce expenditure on transmission lines.

Allowing for the energy consumed in pumping water to the reservoir from the barrage the net annual output would be 1,610 million kWh. Of this 704 million kWh would be delivered from the primary station and 906 million from the secondary station. The load factor would be 34 per cent. for 730 million kWh and from 10 to 15 per cent. for the remainder, thus eliminating uneconomical peak-load stations. The cost of electricity at the barrage would be 0.2372d. instead of 0.18d.

The Severn Estuary, the site of the proposed colossal tidal power scheme reported on by the Severn Barrage Committee

per kWh. The average cost of generation at the most efficient coal-fired stations to-day is £3 per kW plus 0.14d. per kWh. At 34 per cent. l.f. this is equivalent to 0.375d. The difference (0.1378d.) is in favour of the barrage. It is expected, however, that electricity will be generated at not more than 0.3d. (34 per cent. l.f.) at new stations, such as Battersea.

Comparative Annual Costs

The annual cost of the barrage plant is calculated at £1,623,869, which represents 6.38 per cent. of the capital expenditure. Applying the same ratio to the secondary station, a sum of £14,800,000 could be spent on the latter before the total annual cost would exceed that of the most efficient coal-fired station of the same output at the same load factor. It would be necessary to provide five 80-mile double-circuit lines to supply 550,000 kW to the grid, costing about £3,000,000, but half of this is debited to normal extension of the grid.

A comparison between the annual costs of "thermal" and "hydro" electricity is as follows:—

Coal:	730 million kWh. (34% *l.f.*)	at	0.3d.	= £913,500
	596 " " (15.25% *l.f.*)	"	0.679d.	= 1,686,000
	284 " " (10% *l.f.*)	"	0.962d.	= 1,138,500
				£3,737,000
Water:	Barrage power station			£1,623,869
	Reservoir and storage station			827,416
				£2,451,285
Saving in favour of water power				£1,285,715
Saving if interest for coal-fired stations is taken at 4% instead of 6½%				£1,099,215

The number of men directly employed would reach a maximum of 17,534 in the thirteenth year of construction, with an average of 7,570 per annum; these include 10,116 engaged in engineering workshops with an average of 2,258 per annum. Of the total expenditure of £39.5 millions, buildings, masonry, and temporary works would account for £23 millions, and steel and ironwork, machinery, electrical equipment, &c., for £14.7 millions.

Domestic Apparatus at Leipzig. By Viola Ripley, B.Sc.

A COMPLETE departure from normal practice in the design of desk-fans is provided by a new type shown by the A.E.G. at the Leipzig Spring Fair. This fan has been designed specially to reduce weight and so make it more suitable for export. The usual rotating metal blades are replaced by three strips of silk tape attached to a rotating outer member of the motor. The bands are held out by centrifugal force and provide excellent ventilation. As they can be touched without danger even when rotating at full speed, the usual wire guard is omitted. The oscillator mechanism is rendered unnecessary because the angle of distribution of the air is greater than usual. The whole of the accessible parts, except the silk bands, are constructed of moulded insulation material. The foot carries a speed regulator switch with off-position and by means of joints in the upright portion the direction of the air stream can be varied between 20 deg. above and 15 deg. below the horizontal. The new type is equivalent to an ordinary 12 in. fan and the universal motor has a 32-W loading.

A novel A.E.G. fan

The Siemens-Schuckert concern shows cheaper models of its established cooking ranges and a new model combined with a small coal fire. A new table cooker has three plug-in boiling plates and is provided with double-pole switches. The A.E.G. high-speed hotplate is particularly suitable for small jobs in the kitchen and for the preparation of breakfast. Quick heating is attained by a loading of 1,200 W with a diameter of only 5½ in. Current is automatically switched on when a vessel is in place, by means of a stud which projects normally from the centre of the plate. The surface is machined and the base enamelled. By combining three existing components the same firm has developed an economy cooker, consisting of an oven (1,600 W) above which are two double hotplates, one of which is provided with an "economy" cover to reduce evaporation and heat losses.

A tilting frying pan

The Prometheus Co. has brought out a directly heated, pivoted frying-pan, 20 in. in diameter, specially suitable for restaurants. It will cook 150 cutlets an hour and is also suitable for potatoes. A neat milk heater is now available for the company's hot-water jug, and it makes a special point of its single hotplates, 12 and 16 in. in diameter, for preparing large quantities of food, boiling clothes, &c., and of 5 and 10-kW hotplates for restaurant use.

Improvements in the Siemens "Protos" suction cleaners include increased suction and quieter running, wheels and a paint spray attachment are obtainable for the two larger models. The Santos refrigerators are shown in new forms.

Siemens suction cleaners

In the Siemens drum-type washing machine the horizontal drum is oscillated electrically and heated by electricity or other means. Rinsing can be carried out in the same drum. The same company's centrifugal dryer has been redesigned and the main spindle is now flexibly suspended. The "Protos" suction cleaner motor is used with a powerful heating element in the large hair-dryer produced for hairdressers. The same firm shows a safety razor running from a pocket battery. A miniature motor is placed in the handle and oscillates the razor blade at about 100 times per second.

A new light for a sewing machine is shown by the A.E.G. and a motor arranged for either friction or belt drive. The particular advantage of the new design is that by using a high speed rotor (4,500 r.p.m.) it has been possible to keep the size very small and the motor runs very quietly. Speed regulation for the 30-W universal motor is obtained by either a foot or a knee control which is a great convenience.

The "Protos" washing machine

The Sachsenwerke in addition to radio apparatus is showing some new small d.c. and a.c. motors. Light metals are extensively used in the a.c. patterns. This concern's domestic motors are particularly quiet in running and may be supplied complete with devices to prevent interference with radio reception.

The A.E.G. show a synchronous motor unit suitable for building into radio switch clocks, alarm clocks and advertising novelties as well as ordinary clocks. The rotor is self-starting and revolves at 250 r.p.m. The construction is extremely simple, the stator consisting of an iron cup with a number of teeth provided with a centre pole carrying the winding. The centre pole is drilled through and has bronze bearings for the rotor spindle. The slow rotation is attained by having a smaller number of pole teeth on the rotor than on the stator. The rating of this machine is only 2.3 W.

An electric safety razor

Loading increased to 6 kW speeds up the rate of heating in the "Protos" storage tanks. The Siemens 1-kW fire has the heating elements arranged along a single bar so that the whole reflector glows on half heat.

Standard Paper-insulated Cables

B.S.S. No. 480 is of more than usual interest. It supersedes B.S.S. No. 7-1926 in so far as the latter relates to paper-insulated cables, and it is virtually a new specification. The main modifications relate to the thicknesses of insulation and metallic sheathing. The method of stating these thicknesses is new, and the actual thicknesses have been reduced, but they are not so great as would appear from a first glance at the tables, since the new figures represent minimum thicknesses at any point in the wall of the cable, whereas in the 1926 specification a tolerance of 10 per cent. below the thicknesses stated in the tables was permitted provided that the mean of the thicknesses around the circumference was not less than the standard value. The new specification introduces, for the first time, tables of dimensions for 460- and 20,000-V cables. An appendix is also included, giving a schedule of recommended colours for the cores of paper-insulated cables. Copies of the specification may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Power Cable Ionisation

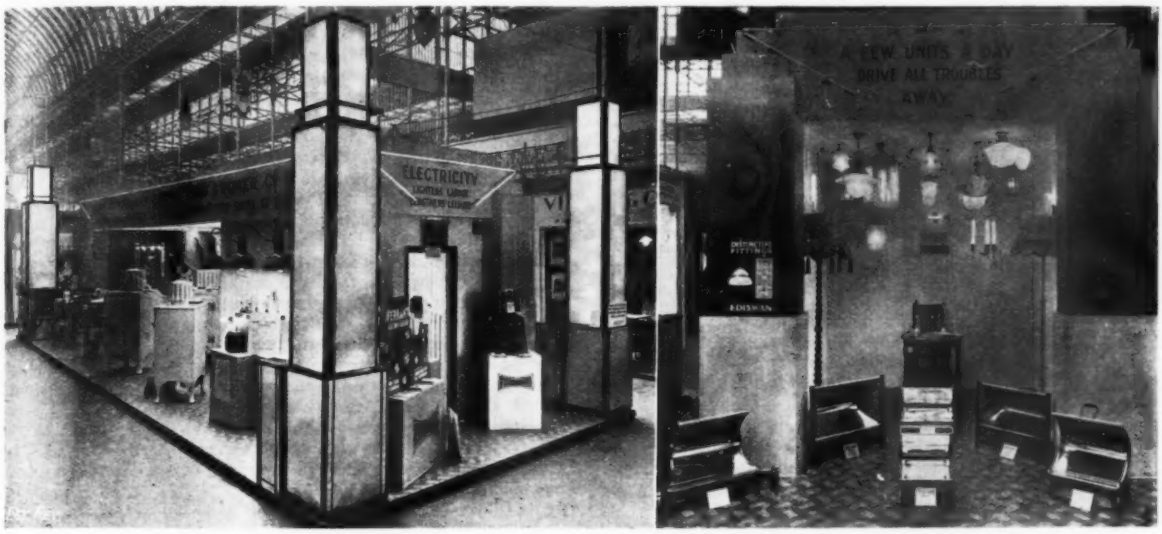
THE discussion on Mr. P. Dunsheath's paper on "Ionisation in Cable Dielectrics" (to which reference was made last week) at the INSTITUTION OF ELECTRICAL ENGINEERS in London, on March 9th, was opened by Mr. B. Welbourn, who thought that the manufacture of 33-kV cable might well be standardised now. The author's defence of the 66-kV type of solid cable had not been so good. In London alone over two miles of single-conductor 66-kV cable had been in use for two and a half years, and on the North-East Coast many thousands of yards had been in satisfactory operation for well over seven years. A drum length of 100 yards was not sufficient for testing stability. By modifying the temperature rating the 66-kV loading could be increased and so make the solid cable more competitive with the oil-filled type.

Mr. P. V. Hunter and Mr. C. J. Beaver described new methods of cable construction, to which extended reference is made on p. 376.

After-laying Tests Essential

Mr. A. D. Constable was ready to agree that solid cable could be made perfectly good in the factory, but only an optimist would assume that it would remain in precisely the same condition after being laid in the ground. Therefore, tests should be applied after the cable had been laid, not before it left the factory. The gas-pressure cable was not at present the ideal type, but it might become so. Dr. E. Bowden remarked that most cable users seemed to have lost their nerve. It was refreshing to hear the author defend an old type of cable, and the paper should help to restore lost confidence. It showed that cable manufacture was becoming an exact science and would be a good text book for those about to embark on cable research.

Dr. L. G. Brazier said that the results obtained by the author's analysis of cable losses and differentiation between different kinds of losses could be obtained in another way without inconvenience from the original power factor curves. It was not desirable that the author's method should be adopted generally. Mr. T. N. Riley criticised some of the results described as satisfactory in the paper. He could not understand the author's stability tests nor the reason why he used so long a cooling period. Test conditions should be at least a little more severe than service cycle conditions. The over-voltage should be greater when the number of test cycles was small.



One of the combined stands of the County, South London and South Metropolitan Companies at the South London Exhibition, now being held at the Crystal Palace. A number of the leading electrical manufacturers have contributed to the display

Impregnation Questions

Mr. J. K. Webb asked whether tank impregnation was really suitable for 66-kV solid cables. Could the materials be properly conditioned before the cable was put into the tank? Manufacturing tolerances were very small. Why could not impregnation be done after the sheath was applied to the cable? By spot welding a nipple to the lead, the sheath of a factory length could be tapped anywhere and oil forced in through the nipple wherever it was needed. Testing could be facilitated by the use of condenser end cones, to which further reference is made on p. 376. Mr. T. R. Scott thought the author's defence of the solid cable rather feeble. He would like to join Mr. Welbourn in supplying the author with ammunition. The solid cable would recover its ancient reputation.

Mr. Dunsheath, in reply, remarked that testing had an economic as well as a technical aspect. Was it worth while spending money on test elaboration if this produced no further evidence or information? Some speakers had criticised his results, while others had quoted figures that even he could not claim, all of which showed that one must not believe everything one was told.

What is the Best Rural Distribution System?

FOUR papers on systems of distribution in rural areas and voltage regulation were read at the monthly meeting of the OVERHEAD LINES ASSOCIATION in London on March 15th. It is not always realised that the countryside is not uniform in type. The conventional village can be served in the usual way from a central distribution point with four-wire distributors radiating therefrom of, say, 0.1 sq. in. and 0.25 mile long, allowing a voltage drop of 5 per cent.

Mr. W. Fennell points out in his paper that in Mid-Cheshire several such systems are producing good results, especially where the low-voltage mains can be interconnected. A change is coming over the countryside, however. Residential and agricultural areas are blending, and "ribbon building" along the highways will, he thinks, increase rapidly. This rural development along the main roads and adjoining lanes is providing a large and increasing field for electrical service, which he maintains is not suitable for four-wire l.v. distribution (which presumes a centre, but there is none).

Such "ribbon" cottages and small-holdings are "sure" consumers with a commencing load of little more than lighting. The more well-to-do residences require from 3 to 10 kW each. They are the result of the motor car and the availability of cheap electricity for cooking and heating, which are important factors in the choice of a home. Presuming high-voltage distribution extends to the areas of these settlements, the suburbs of towns will become more and more boarding houses for those who cannot afford to live more than a few miles out.

To deal with either lay-out, whether we look to the present or the future requirements, there is a need for high-voltage distribution. Should two lay-outs be provided (1) high voltage and (2) low voltage side by side along the "ribbon" developments; or are they to be joined into one system on one set of poles?

A compound overhead line used by the author is described in detail. It consists of two high-voltage and one low-voltage conductors, using the earth wire as the return line, all on one set of poles. Safety is assured by guards and the net saving is one conductor wire. A single-phase line can be converted to

three-phase by the addition of a second cross-arm near the top of the pole and another line wire.

The advantages of this system are (1) reduced capital outlay; (2) whatever load develops within reason along the route practically no more capital expenditure is required than that needed for transformers and service lines. Moreover, if a considerable demand arises to the right or the left of the compound lines, a h.p. branch can be sent out and there is no question of going back to a distant termination to bring up a new h.p. main to feed the branch; (3) H poles for transformers are unnecessary; (4) as transformers are small, they are all "pole erected," and there is nothing to pay for sub-station sites; there is only one main in any locality.

Line Costs

Mr. R. J. Jocelyn Swan explains that in his Chesham areas he generally erects three-phase four-wire lines and single-phase two-wire lines in small villages and for clusters of houses. His paper contains a mass of cost data and he suggests that to-day the difference between the costs of underground cables and overhead lines is nothing like what it used to be. Representative detailed figures for many lines are quoted, and attention is directed to the need for assisting voltage regulation by erecting sufficiently large distributing lines and balancing the load.

He does not think there is any advantage in erecting low-voltage lines larger than 0.15 sq. in.; generally 0.1 sq. in. is large enough, especially if the transformer can be placed at the load centre. Whatever the loading may be, better voltage regulation is obtained by the use of three-phase four-wire lines than three-wire single-phase lines. His company is carrying out its obligation by extending its lines to every part of its area, irrespective of the annual revenue.

Boosters and Balancers

Mr. W. A. Turnbull's paper also contains statistics and cost comparisons. At Aylesbury he is standardising single-phase three-wire (two 0.1 and one 0.05 sq. in.) distribution. If 0.1 sq. in. is not large enough, recourse is had to an extra sub-station. He does not favour three-phase distribution. He intends to use automatic boosters for dealing with voltage drop. They need be of about 2-kW capacity only, so their price should fall in the near future to an economic level.

Single-phase static balancers are effective and efficient, and can occasionally be put on the proper side of a consumer's meters where the complaining consumer has a three-wire supply. Three-phase static balancers are decidedly more costly with the complication of the extra phase. Erecting a second sub-station in the village, say, half a mile from the existing sub-station (villages are often of the ribbon type) is simple with single-phase two-wire 7/12 steel compared with three-phase. His single-phase 11,000-V 7/12 steel wire lines cost £176 per mile, and are much cheaper to erect and maintain with only two high-voltage wires to control. With regard to power supply, the advantage of three-phase motors compared with single-phase motors should have very little weight.

Voltage Regulation

Mr. E. T. Norris explains how good voltage regulation is a matter of principle as well as profit. Its effect on the reputation of electrical service is serious; if the voltage is too high it shortens the life of apparatus; if too low it reduces performance, both of which are attributed by the consumer to defective manufacture.

There is no inherent difficulty in the problem. Much can be done by the correct choice and lay-out of mains, feeders, and sub-stations. The recent development of automatic regulators economically suitable for small ratings permits rapid and flexible correction of voltage variations. Indeed, their cost is usually more than balanced by the increased capacity of distribution lines and feeders which follows from their use, quite apart from the improvement in voltage variation.

Automatic regulators can be installed speedily and with no interference with the existing layout. If, as is recommended by the author, one or two sizes of regulator are standardised, they can be kept in stock and put into service immediately as conditions require. Since most domestic loads are of constant impedance, the revenue to the supply undertaking will depend upon the square of the voltage. Appreciable voltage drop therefore reduces considerably the kWh consumed. Automatic regulators are similar to ordinary transformers. The author considers the economic aspect of their use and their operating advantages.

Recent Physical Developments

AMONG papers read before the PHYSICAL SOCIETY in London recently was one by Messrs. J. A. Ratcliffe and E. L. C. White, who describe apparatus in use at the Cavendish Laboratory, Cambridge, for the continuous automatic recording of the equivalent height of wireless echos returned from the ionosphere. They consider that increased ionisation in the lower region during darkness without a corresponding increase in the upper region is probably due to the action of storm clouds.

Dr. N. L. Yates-Fish, University College, London, demonstrated a valve transmitter of ultra-short waves (65 cm.) which functions on the Barkhausen-Kurz principle.

Dr. L. F. Bates and Mr. B. J. Lloyd Evans, University College, London, described a compact electro-magnet suitable for many branches of research work. It has specially constructed coils, which are cooled by the circulation of oil. Some tests and experiments made with a magnetic potentiometer were also described.

Mr. J. V. Hughes read a paper on the spurious ring exhibited by fluorescent screens used for the observation of electrons, which is due to total internal reflection of the light at the upper surface of the glass block of the screen. Mr. N. Thompson, Sheffield University, described an addition to the usual form of recording micro-photometer which provides a record on which ordinates are linearly proportional to light intensities.

The Grampian Scheme and Its Future

THE paper which was read by Messrs. A. S. Valentine, H. M. Gibb, and E. M. Bergstrom, before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND, on March 14th, describes the Grampian hydro-electric works, Loch Ericht development.

Of the Scottish water-power sites, the watershed of the Grampians and the River Tay are the most important, a number of lochs situated at a comparatively high level draining into the North Sea. These natural features are of the highest value for impounding purposes, which renders possible the development of the maximum amount of power from this catchment area.

The Grampian Electricity Act, 1922, powers were transferred to the Grampian Electricity Supply Co. and developed by the Scottish Power Co., Ltd., under whose control the present scheme has been carried out. In times of flood the Tummel station will take the base load and storage be effected at Loch Ericht, and *vice versa* during low-water periods. The Loch Rannoch power station has been designed for an ultimate capacity of 66,000 h.p., and power units of 44,000 h.p. have been commercially operated since November, 1930. The second stage, comprising the power station on the River Tummel, is now under construction and is designed for an installed capacity of 44,000 h.p.

The dam across the River Tummel under construction

Power in bulk to the extent of 12,000 kW is now being supplied to the Central Electricity Board from the Rannoch station, and the Board has contracted for a further 12,000 kW on the completion of the Tummel section. In addition, the Grampian Electricity Supply Co. is authorised to supply electricity for all purposes over an area of 4,214 sq. miles.

The major part of the paper is concerned with the civil engineering and hydraulic aspects of the scheme. The two generating sets at present installed are driven by vertical Francis water turbines enclosed in spiral casings. Each is of 22,000 h.p. operating under a net head of 515 ft. at 500 r.p.m. At the minimum head of 396 ft. the output is 15,000 h.p. The vertical alternators are rated at 20,000 kVA, 50 cycles,

3-phase, 500 r.p.m., 11,000 V. They will generate up to 12,500 V for short periods, and compressed-air brakes are provided to stop the rotating parts in five minutes.

The main switchgear is of the cellular type, and the circuit breakers are of 750,000-kVA capacity. An outdoor sub-station steps up the voltage from 11 to 33 and 132 kV for transmission. Steel towers carry four separate circuits—two 132-kV lines above two 33-kV lines.

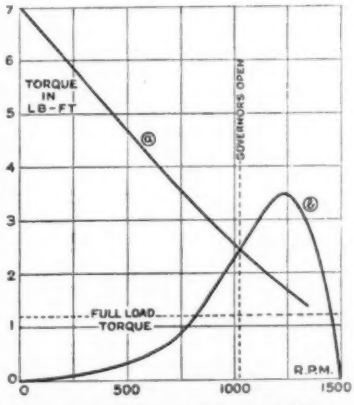
* * *

Modern Electric Signs

The general trend in modern electric sign practice is towards the more universal use of luminous gas-discharge tubes to the exclusion of other forms of illumination for signs, said Capt. C. Higgins when addressing the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS in London recently. Exceptional development of the technique of installation had permitted the use of luminous gas-discharge tubes in animated signs, and many installations had been completed in which complicated movements had been performed, using only such tubes. Developments in small box signs and window display apparatus all tended toward the more universal use of discharge tubes, either in the form of ordinary luminous gas-discharge tubes or the newer ripple tube. The manner in which such tubes work was described and also the manner in which different effects were produced. The sign background was also dealt with, together with the high- and low-voltage accessory gear. Useful information was given relative to transformers, cabling, and switchgear, while the need for power-factor correction was pointed out, and the technical significance of neglecting this was made clear.

Fractional H.P. Motors

A RANGE of fractional h.p. motors of from ⅛ to ½ or 1 h.p. (depending upon the speed) has been put on the market by Messrs. Higgs Motors, Witton, Birmingham. The machine shells are of drawn steel; this reduces the overall diameter and weight, obviates the use of clamping bolts through the stampings, and permits the feet to be easily interchanged. The terminals are placed above the bearings (being thus kept free from oil) and do not protrude beyond the normal dimensions of the machine. The oil wells are cast as an integral part of the end cover, and oil flingers and drains are fitted to all bearings, which are normally of phosphor bronze, but ball bearings can be supplied.

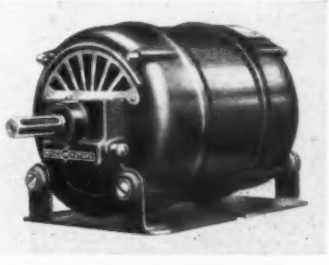


Torque curves for a 1/3-h.p., 115/230-V, 1,440-r.p.m., single-phase motor. (a) As repulsion motor; (b) as induction motor

The shaft extension is provided with a collar against which the pulley can be fitted, and an undersized bush can be used to obviate the necessity of a new shaft should the journals wear. Frames within certain groups are interchangeable with regard to shaft extension, centre height, and distances from the shaft collar to the first bolt hole and between feet at right angles to the shaft. The finish is stove enamel, nickel plated.

The motors are made in three types. The "D.W." compound-wound d.c. machines have a starting torque 500 per cent. of full load torque with five times full load current; they are fitted with brush rockers and sliding box brush-holders, which is not the general practice with miniature motors. The "D.H." split-phase induction machines have a starting torque 125 per cent. of f.l.t. with six to seven times f.l.c.; a centrifugal switch is fitted and no rotating parts are in contact when the machine is up to speed.

Type "D.S." repulsion-start induction motors up to and including ¼ h.p. develop from 300 to 350 per cent. f.l.t. with twice f.l.c., and from ¼ h.p. upwards from 450 to 550 f.l.t. with 2½ times f.l.c. The governor mechanism is of Messrs. Higgs's own design, power being transmitted from the governor to the sleeve through a series of balls in a tube. The advantages claimed for the method are (a) reliability due to the elimination of sticking, (b) reduced end room, and (c) long life. The commutator short-circuiting gear is entirely enclosed and considerable wear on the brushes is permissible before renewal. The "D.S." machines are specially designed for operating such plant as refrigerators.



One of the new Higgs motors

Met.-Vickers Men Arrested in Russia

MUCH concern has been felt this week regarding reports received from Moscow concerning the arrest of a number of representatives of the Metropolitan-Vickers Electrical Co., Ltd., by the "Ogpu." According to *Reuter*, a raid took place on the residence of Mr. Alan Monkhouse, the company's manager in Russia, while he was dining with Mr. W. H. Thornton, his chief engineer, and two other guests. The homes of Messrs. Monkhouse and Thornton were thoroughly searched, and the Met-Vickers business offices in the general headquarters of the Russian organisation Electro-Import in Moscow were raided, records and other papers being seized. Messrs. John Cushny, W. MacDonald, C. Nordwall, Gregory, and a number of members of the staff of Russian nationality were also arrested.

The offices of the company at Leningrad are also stated to have been raided, but the manager, Mr. Francis Tearle, was not arrested. Later information states that Messrs. Monkhouse and Nordwall have been set at liberty, but have been ordered to remain in Russia. Mr. Monkhouse held a telephonic conversation with his wife in this country on Tuesday, and said that he had been kindly treated.

The company made representations to the Foreign Office and to the Russian Ambassador in London. As our readers are aware, it has been carrying out large electrical, power station contracts, and other work for the Russian Government for many years past. It is entirely at a loss to understand the matter, and is confident that a mistake has been made. It has a strict rule that every employé in its Russian business must have nothing to do with political and allied matters.

The text of the "Ogpu" official statement regarding the arrests is quoted by *Reuter* as follows:—

"Investigation of a series of unexpected and consecutive accidents which occurred recently in big electrical power stations—at Moscow, Cheliabinsk, Zuvesk, Zlatoust—has revealed that they were due to the sabotaging activities of a group of criminal elements among the employés of the Commissariat of Heavy Industry, who set themselves the task of destroying the electric power systems of the Soviet Union and bringing a halt to the work of the enterprise served by them. The investigation disclosed that in these activities were also engaged certain employés of the English firm of Metropolitan-Vickers, who were working in the Soviet Union on the basis of an agreement for technical aid to the enterprises of the electrical industry in the Soviet Union."

Messrs. Thornton & Monkhouse, two of the engineers detained by the "Ogpu"

Sir Felix Pole, the chairman of the company, was at the Foreign Office on Monday, and a question was asked in the House of Commons on the same day. Mr. Baldwin replied that he was in communication with H.M. Ambassador in Moscow.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Queer Joint Box

I venture to think that the accompanying photograph may be of interest to some of your readers. This specimen of an improvised joint box was discovered on a lighting installation carried out in the lead-covered system when an examination was made as to the cause of certain faults which had developed.

The wireman evidently endeavoured to make the best of the material at his disposal, and the honest attempt at making an efficient bond was worthy of a better fate, though the ultimate result obviously leaves much to be desired and forms but one more example of the happy-go-lucky methods of certain self-styled electrical contractors described from time to time in your columns, which persist despite the efforts of the supply companies, trade associations, and last, but not least, the electrical Press.

In spite of its antecedents polish is not the chief feature of this "joint box"

M. C. CAMPBELL.

Steyning, Sussex, *March 8th.*

Canvassers and Canvassing

Canvassing is going to play an important part in the obtaining of business for electricity supply undertakings in the future. There is a danger of the duties and requirements of a canvasser being under-estimated, and there may be a tendency to reduce the importance of the position to that of the door-to-door man one meets with every day, hawking a hundred and one things. Unless undertakings put the position on a satisfactory basis, and give it status at the outset, they cannot expect to attract the right type of man. Engineers may find it difficult to appreciate that men with qualifications of some description are required to undertake such duties for satisfactory results to be obtained.

A great deal has been said and written recently about organising a national canvassing campaign and schemes to provide the demand which the grid is able to supply, but national efforts of any kind are only successful after parochial interest has been stimulated, with each authority doing its bit and pulling its weight. To achieve success improved methods of marketing will have to be evolved. The industry is selling a service, and there should be little difference in the methods employed from those of industries selling other products. Why should engineers imagine otherwise? Being a competitive industry, competitive ideas should be adopted. On the contrary, it appears to be taken for granted that we are a monopoly, and that monopolies succeed without such ideas. The canvasser's difficulties could be lightened by simplified tariffs, dispensing with numerous petty charges and reducing restrictions of a like nature to a minimum.

The selection of the right type of man for canvassing should not be a difficult one. How many chiefs realise that perhaps they have not handled this comparatively simple matter effectively? In their department there may be assistants who, with sympathetic handling and encouragement, can produce results. Many a canvasser is a potential sales manager if he receives the right treatment and recognition for his efforts. On the other hand, men partly unsuited for the duties of canvassing—perhaps through temperament, self-consciousness or natural embarrassment—continue to do the work daily because it is a job after all, although they could be better employed on work in another section to the mutual advantage of themselves and their departments.

A. V. CROSS.

Walsall, *March 3rd.*

Neon Sign Connections

No doubt from time to time many of your readers come up against rules and regulations made by various authorities which do not appear to hold water, and are contrary to standard electrical practice. It would, no doubt, be to the interest of the trade, and the neon sign contractor in particular, if we could obtain expressions of opinion and particulars of experience of enclosing high-voltage v.i.r. cables in ordinary screwed conduit, as required by some of the local authorities.

In the erection of neon signs long single runs of high-voltage cables are called for, carrying current at voltages of 5,000 to earth. From my experience of voltages up to 6,000 to earth, I have found that when the runs are straight and without bends, the enclosed high-voltage cables have stood up, but when bends, however slight, are introduced, I have experienced trouble, obviously from ozone attacking the cable at the points of the insulation. I am not aware of any cable manufacturers who would care to guarantee that their cables would stand up under these conditions indefinitely.

The standard original practice of using lead-covered high-voltage cable for neon sign work has in the past proved to be free from trouble in the above respect; it undoubtedly makes a sound electrical job, as the lead covering acts as an earthed metal sheath in contact with the outer surface of the insulation, thereby restricting the formation of ozone, which attacks the insulation. Ozone formation is limited to the amount of free air round the insulation of the cable, which in a lead-covered cable is greatly restricted.

G. BRUCE.

London, N., *March 10th.*

A Call to Action

I should be glad of the courtesy of your columns in order to draw attention to the question of professional unemployment in the electrical industry, and the desperate position in which some engineers find themselves, facts which, to my mind, are not sufficiently recognised by the industry and solutions for which can only properly be obtained by early, vigorous, and co-operative action by the members of the industry themselves.

Modern governments plunder the professional classes at all times, and the huge system of social services has been built up largely at their expense. In such times as these, the urge of economy has reacted upon many professional engineers in such a way as will make ultimate recovery, even if possible, a very difficult task. Our statesmen, however, with their attention ever focused on future votes, boldly assert that "there is to be no economy on social services." Whilst the necessity of a measure of social service is not denied, compensation for wage earners, to the extent of 20-30 per cent. of normal wages when in employment, is a consolation which many professional men would be pleased to have.

For many professional engineers, with normal, unextravagant obligations entered into in more prosperous times, existence has become precarious; houses, furniture, insurance—everything saleable—have been sacrificed—to what end? There are others, who, after long and able service in the Colonies and Dominions, find themselves practically friendless in this great metropolis, with hope gradually diminishing and prospects of gainful employment becoming more remote. Some are assisted in the matter of a home and in other ways by relatives and friends; there are others who have not even this advantage. The stoical courage demanded of such men deserves a better fate, and, whilst they firmly believe in an early revival, there are still doubts as to whether all can morally and professionally survive till that time arrives.

In bad times especially, economy is the rule, but the type ordered by our rulers debars reproductive expenditure on such

problems and schemes as housing, railway electrification, telephone development, and electrical distribution. With thousands of millions of capital virtually idle in the banks, it should not be possible to leave such urgent matters in abeyance any longer, and their execution through the ordinary channels of industry would do much to assist professional engineers in common with others. Will the leaders of the industry group themselves for a determined and vigorous attempt to get these things done? To quote from a recently published comment: "The confidence based on grimly holding on is only static, while that inspired by launching out is dynamic, and there is the same difference between the two as between rest and motion, death and life."

A word on the individual side. Will the industry, with voluntary service, and through some existing nucleus, form an Advisory and Employment Bureau to which individual application can be made for advice and guidance? There are many who, by force of circumstances, will be compelled to change their particular branch of employment in the industry for new and unexplored fields; in such cases the assistance of a trained psychologist will be invaluable. To enhance the usefulness of such a proposed bureau it may be found possible to incorporate some form of "occupational centre," as is the case with wage-earners receiving unemployment benefit. On the intellectual side, short courses of lectures, by leaders of the industry, might be undertaken, which could reasonably be expected to maintain morale and encourage the spirit of sociability.

I feel it is necessary, and believe it is possible, to carry out such a scheme, which, however, must be highly active and not merely passive, for such period as the emergency exists. Who will give a lead? C. E. E.

March 8th.

The "Juniors" Jubilee

The members of the Junior Institution of Engineers, including many who joined the original society in 1884, will be taking part in the celebration of the Institution's Jubilee in June, 1934. It is thought that others who in the early stages of their professional careers were "Juniors," but later, for various reasons, allowed their membership to lapse, would like to take advantage of this opportunity to renew their acquaintanceship with some of those who were their associates in the Institution, and with them to celebrate its Jubilee.

Through the courtesy of your columns, the Council desires this letter to be taken as an invitation to such former members to communicate with me. They will then be informed individually of the details of the activities that are in process of being arranged.

Herbert G. Riddle,
Secretary,
Junior Institution of Engineers.

39, Victoria Street, S.W.1, *March 9th.*

On Their Doorsteps

Mr. A. V. Cross strikes a sound theoretical note in his appeal to "catch them young," but surely the apathy he finds is largely due to the short-sighted and indifferent attitude of many supply concerns. Local authorities often set good examples, but private companies seem hopelessly lacking in initiative. In south-east London there are large numbers of good working-class homes, many owned by their occupiers, yet the only response to one's repeated appeals for a supply is a curt: "We regret we have no cable in this street and do not contemplate any extension at present." It is impossible even to learn what number of consumers or other circumstance would tempt the suppliers to lay mains. Surely such a policy fosters indifference (and affords much amusement to gas interests), for, while reaching out for questionable rural loads, these companies ignore entirely the great market on their own doorsteps.

Nil Desperandum.

London, S.E., *March 8th.*

Engineering Apprenticeship

The method of qualification so successfully pursued by "A.M.I.E.E." and Mr. B. A. Cronin demands not only considerable ability, but also robust health—the former because of the shorter time available for study and the latter because of the drain on the physical resources. Many acquaintances of mine have been compelled to abandon the attempt owing to physical disabilities; others succeeded—but paid the penalty of premature ill-health in later years.

Consequently "Pater," before committing his son to "work by day and study by night," would do well to satisfy himself—even by medical examination—of his son's fitness to withstand the considerable mental and physical strain involved.

Finchley, N.3, *March 6th.* Thomas Ellis.

Reactive Current

The article by Mr. G. W. Stubbings appearing in your issue of March 3rd is a welcome contribution to a subject about which there is, unfortunately, a great deal of confused thinking. Your contributor, in drawing attention to the difference between the American and British definitions of the reactive component of an alternating current, has struck at the heart of the power factor probem as applied to non-sinusoidal a.c. circuits. But I venture to suggest that his explanation of this difference is incomplete in that no account is given of the relationship between two components of current so differently defined.

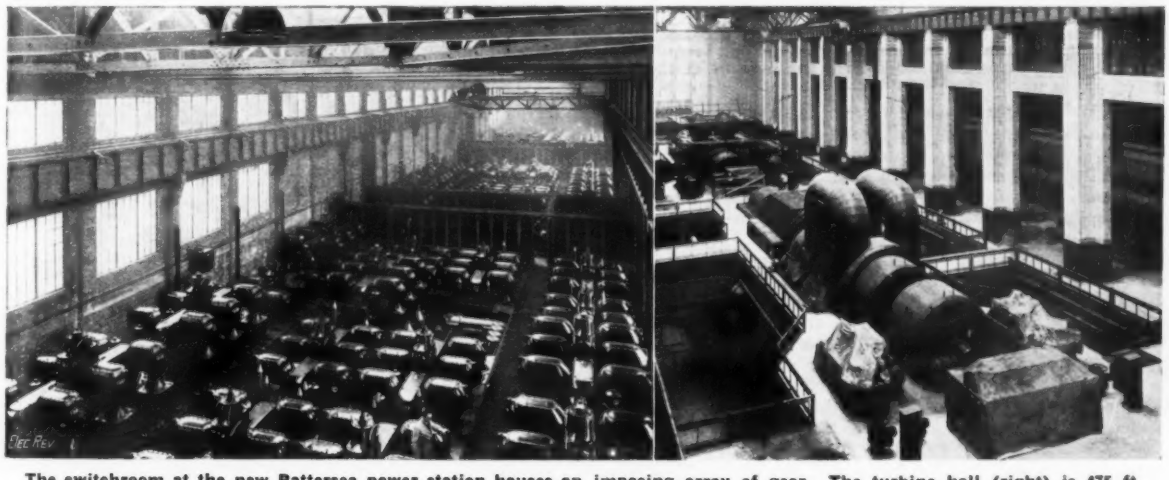
For reasons that are made clear in a paper of mine shortly to be published in the *Journal* of the I.E.E., the American definition leads to a component of current which is itself the vector sum of two further components. One of these is the reactive component according to the British definition, whilst the other is a component of current arising from the presence of harmonics and for which I have proposed the term "harmonic component." The latter component is in quadrature with both the active and reactive components of the alternating current, and may be represented in a three-dimensional diagram by a vector at right angles to the sinusoidal plane. The reactive component according to the American definition, although in quadrature with the active component, does not lie in the sinusoidal plane and consequently does not represent a *reactive* current but a *wattless* current. It is only rational, therefore, to designate it as the "wattless component" of the alternating current as distinct from the true "reactive component."

The harmonic component, then, being defined as the vector difference of the wattless component and the reactive component of the alternating current is given by

$$I\sqrt{[(\sin^2\phi+n_2^2+\ldots)-\sin^2\phi]}=I\sqrt{(n_2^2+\ldots)},$$

and is thus simply the vector sum of all the harmonics.

The total or apparent power P_a in the case where a sinusoidal voltage of r.m.s. value E is associated with a non-sinusoidal current of r.m.s. value $I=\sqrt{(I_1^2+I_2^2+I_3^2+\ldots)}$ has *three* distinct components, viz., the *active* power $P=E\,I_1\cos\phi$, the *reactive* power $P_r=E\,I_1\sin\phi$, and the *harmonic*



The switchroom at the new Battersea power station houses an imposing array of gear. The turbine hall (right) is 475 ft. long and 100 ft. high

power $P_h = E\sqrt{(I_2^2 + I_3^2 + \ldots)}$. These components are bound by the fundamental relation $P_a^2 = P^2 + P_r^2 + P_h^2$.

The *wattless* power, being defined as the vector difference of the apparent and active powers, is accordingly given by $P_w = \sqrt{(P_a^2 - P^2 - P^2)} = \sqrt{(P_r^2 + P_h^2)}$.

The power factor is, under these conditions, $\lambda = P/P_a = I_1/I \cdot \cos\phi = \mu \cdot \cos\phi$, where μ is the ratio of the r.m.s. value of the fundamental component I_1 to that of the total current I, and is generally known as the *distortion factor*. The ratio $\cos\phi$ is then usually termed the *displacement factor* and is indicated by an ordinary power factor meter connected in the circuit.

H. RISSIK.

Stafford, *March 3rd.*

Distribution and the Small Undertaking

In your issue of March 3rd Mr. A. W. Blake brings forward some very interesting graphs and figures to support his contention that it would have been better for the C.E.B. tariff to have been lower for the low-load factor undertakings and higher for the high ones—in fact, to have had a small fixed

A novel indicator has just been installed at Charing Cross Underground station. By dialling the station required a passenger is able to see immediately the amount of the fare and the route to take

charge and a larger running charge. His case, though argued on grounds of expediency, could probably have been supported also by considerations of economic equity, because a tariff based strictly on costs does not allow for what may be called "differential diversity," *i.e.*, the probability that a number of 10 per cent. load-factor consumptions will have a greater diversity than a number of 50 per cent. ones.

There are, however, a number of points on the other side, two of which may be stated here. It was shown in the ELECTRICAL REVIEW of January 20th last that the C.E.B. fixed charge is already lower than the mean generating charge of authorised undertakings, whilst the running charge is slightly higher. The change proposed by Mr. Blake would accentuate this. In the second place, it is necessary to consider not only existing undertakings, but existing (and prospective) private generating plants. An individual factory consumer with a poor load factor has very rarely anything to gain from self-generation unless his load is very enormous, because the public supply is in a position to utilise the diversity between him and his fellows. But if his individual load factor is high the case is otherwise. Were the tariff adjusted so as to militate even slightly against the large consumers with high load factors, some of these might generate for themselves. A lessened use of the national system would then increase the burden of the overhead costs and ultimately react adversely on the small undertakings also.

The C.E.B. tariff would therefore appear to be aimed not so much at giving the greatest happiness to the greatest number (of undertakings) nor with dispensing even-handed justice, but rather at making an economic success of its scheme, and through it of the supply industry as a whole.

D. J. BOLTON.

London, *March 6th.*

Shock Protection

Mr. A. E. Gaster's letter is very depressing, as it is yet another instance of the critic of artificial earthing being content with extremely scant information concerning it. Several erroneous statements are lumped together and the conclusion drawn that the system is not only useless, but may, in addition, become a source of danger. In the first place, I have never seen it claimed that these protective switches operate on 20 V leakage potential; such a statement must be misleading unless the resistance of the earth path is also stated. With negligible earth resistance protective switches used with artificial earthing systems will operate with as low a potential as 2 V; one would only expect a voltage of 20 to be necessary against an earthing resistance of about 100 ohms. How would Mr. Gaster isolate a circuit against such an earthing resistance? Secondly, the speed of operation can be shown by oscillograph to be within 1½ to two alternations of the supply; not quite so fast as a fuse (properly calibrated), but fast enough for all practical purposes. The total *impedance* of the high resistance coil at 50 cycles is only about 60 ohms, and the windings are quite robust.

Mr. Gaster's remedy for all our troubles is the old exploded one of "earthing properly," and perhaps he will explain how this should be carried out in connection with a portable farm motor where the best earth connection that can be obtained offers a resistance of 50 ohms—a very common figure. It is in respect of rural areas that the greatest advantages of artificial earthing are claimed, although there are many advantages for the town installation also.

Mr. Gaster is presumably not aware that he may utilise artificial earthing *in parallel with his solid earthing*, should he seriously object to the "delicate high resistance," which does not exist in fact. I will conclude with the hope that serious members of the industry will examine new ideas with unbiased minds, remembering that those methods that were good enough for our fathers are not necessarily good enough for us.

T. C. GILBERT, A.M.I.E.E.

Folkestone, *March 11th.*

I entirely disagree with one of Mr. A. E. Gaster's statements. He says that the protective gear referred to is of little practical value, adding that it gives a false sense of security and is more a danger than a safeguard.

So far as I can visualise, nothing short of either a broken earth circuit or an earth circuit resistance of many thousands of ohms can permit a high and dangerous potential to appear. In the event of a dead fault, the full line voltage is imposed, but, only momentarily, for, to all intents and purposes the fault is cleared with equal rapidity as the switch action is instantaneous. The leakage current is extremely small and, therefore, even with a poor earth circuit resistance of, say, 100 ohms, perfect protection is always assured. Obviously, the lower the resistance the better the protection afforded.

Dealing with the concluding paragraph of Mr. Gaster's letter, I am wholeheartedly with him in all the good advice he gives, but, even in cases (A) and (B) I suggest that protective gear could with advantage be installed. As for (C) surely a house service box, incorporating overload protection, with a leakage relay would not be considered too unduly complicated a gadget in comparison with the multiplicity of switches and fuses usually met with! No stone should be left unturned to ensure that tests and inspection of insulation and earths are executed with unfailing thoroughness. Nowadays the low initial cost of reliable testing apparatus does much to promote maintenance work, which is more than repaid by the invaluable information derived from systematic routine checking.

S. H. PARSONAGE.

Chiswick, W.4, *March 13th.*

Signs and the Times

I am afraid that the comments under the above heading on page 298 of your March 3rd issue may convey a wrong impression. My paper, which you cite, was intended only to point out the dangers to the trade as a whole of price-cutting.

Neon displays not being standard articles it is, obviously, impossible for an association to fix minimum prices. Every major neon sign is a specially designed, individually made piece of work, and factory costs for it must vary from firm to firm. I did wish to convey that there is a need for the reputable manufacturers to consider their problems together; to pool such commercial information as is useful to all of them, and to undertake separately and individually not to sell signs at an unremunerative price.

Where firms are selling below cost, as in some cases they are, the client does not benefit; maintenance is as important as the actual manufacture of a sign, and buyers of neon signs have already found that a "penny wise" purchase has proved "pound foolish" in the course of a year or two of use.

E. J. SHUTER,
Claude-General Neon Lights, Ltd.

London, W.C.2, *March 14th.*

Turbo-electric Marine Propulsion

In the paper which Mr. H. W. Beara read before the London Students' Section of the Institution of Electrical Engineers on March 10th stress is laid on the fact that turbo-electric propulsion has a somewhat limited application, for economic reasons. The suitability of high-pressure steam turbines and water-tube boilers for marine work is commented upon. A detailed description is given of the propulsion equipment of the s.s. *Viceroy of India*. The final section deals with recent improvements in the manufacture and operation of equipment, particularly of B.T.-H. construction.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

New Centrifugal Pumps

The MIRRLEES WATSON CO., LTD., Scotland Street, Glasgow, has just developed a new range of small general service centrifugal pumps. These are known as the "SC" type, and have been designed for extreme compactness, rigidity and simplicity of erection and operation.

The new model can be installed by unskilled labour and there is no danger of misaligning the shaft in the process of erection. The motor shaft is led through the stuffing box and the impeller, which is keyed and fixed to the end, is of the single-entry type with a rubbing shoulder at the back which, with the holes through the boss, serves to balance hydraulic pressures, and so prevents end thrust on the rotor. The shaft is protected from wear in the stuffing box by a renewable sleeve. The stuffing box is packed with cotton, kept tight by an adjustable gland. The suction cover is registered to the casing and is faced and studded to take the suction pipe for the 3 in. and 4 in. size pumps, and screwed for the 1 in. and 2 in. sizes. The discharge branch is on the top of the casing, and is on the centre line, making alternative rotations unnecessary.

When dirty water or liquid containing acid is to be handled, an independent clean water supply is required and is introduced at the plugged hole on side of stuffing box. The 1 in. pump, with a head of 20 ft., has a capacity of 56 galls. per min., and is priced at £13 5s., while the 4-in. type, with the same head, has a capacity of 490 galls. per min., and is priced at £28 15s. A.c. motors for 3-phase, 50 cycles, 200-550 V are used.

A Flange Connector for Water Heaters

With the new "Xcel" flange connector, introduced by AUTOMATIC ELECTRIC CO., LTD., Milton Road, Edge Lane, Liverpool, facilities are provided for making three connections for a water heater—immersion-heater, thermostat, and drain-cock—by means of one unit, dispensing entirely with holding bolts, solder, and elaborate plumbing work, the complete fitting of a conversion unit taking only a few minutes.

Demonstrating the "Xcel" flange connector

The "Xcel" connector consists of an inner flange, packing ring, outer flange, and the necessary washers. A template is supplied with each outfit for marking off the fixing-holes (which can be cut out with curved shears in a few moments) and a special holder for inserting the flange in the tank. The holes in the inner flange are threaded to take the immersion-heater, &c., which thus holds the flange in position. The result is a neat and workmanlike joint, thoroughly watertight under all conditions.

"Xcel" flanges are available in all sizes from ¼-in. to 2-in. gas, flat and curved. A one-way type is also manufactured in all sizes embodying the same features and advantages.

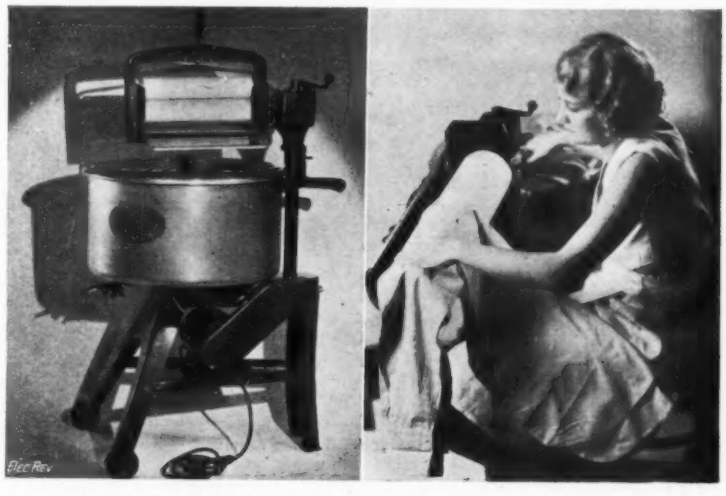
The "Reposalite" Shade

The "Reposalite" reflector shade, made by CHARLES SELZ, 47, New Cavendish Street, W.1, meets the demand for indirect lighting in a remarkable way. It is a shade and reflector combined and throws a brilliant light on to the ceiling, illuminates the shade in the usual way and gives an ample light beneath it for reading, writing, &c. The shade can be easily fitted to an existing floor standard without any alteration to the standard, and can be obtained in any design or colour. Any floor standard shade made can be supplied with a "Reposalite" reflector fixed at an extra charge of 27s. above the price of the actual shade.

Another new line is a range of porcelain and pottery figures mounted as lamps which are available from £4 7s.

A Rotary Ironer

The "Servis" washer has already been described in this journal (April 8th, 1932, p. 531). We are now informed that an electric ironer is available which fits on to this washer in place of the wringer and is driven by the same motor. The ironing is done by allowing a revolving roller to pull the garments between it and a highly polished shoe; a single hand rotating lever controls the pressure applied. The shoe is 26 in. long and has a surface equal to ten ordinary flat irons. The ironer costs £7, and its makers are MESSRS. WILKINS & MITCHELL, Darlaston, Staffs.



The "Servis" washer, showing replaceable wringer, and the new ironer

A Sodium Lamp for Batteries

We have received particulars from PHILIPS INDUSTRIAL, 145, Charing Cross Road, W.C.2, of a new sodium lamp for laboratories. This is a simple form of lamp in which a glow discharge takes place in sodium vapour, the intensity being very high and the radiation practically monochromatic.

The principal radiation is from the yellow sodium doublet; others together have less than 1 per cent. of the strength of the yellow sodium lines. If so desired, some very weak green and blue lines can be filtered away either by a photographic yellow filter or by a potassium-bichromate cell.

A Philips sodium lamp and rectifier

To operate the lamp a Philips rectifier (327) is used. This supplies heating current to the filament, and also provides the necessary voltage for the glow discharge. The lamp is connected to the valve plug of the rectifier by means of a 4-core lead with a 4-pin plug. The primary of the rectifier is directly connected to the mains. To start the discharge, it is necessary only to close the primary circuit of the rectifier by connecting it to the mains. The Dewar flask is placed over the lamp and ensures an even, steady working temperature. The lamp reaches full brightness in about ten minutes after switching on.

Another "Siroma" Vacuum Cleaner

The new "Siroma-de-luxe" embodies all the features of the "Siroma-Super" described in our issue of September 16th, 1932, but in addition it is designed with a deodorising chamber at the back of the motor. No liquids are used, the deodorising medium being in the form of solid matter, which lasts for a considerable time without any attention.

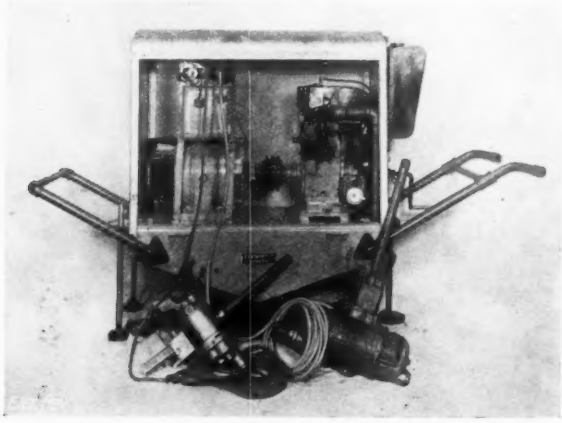
The new "Siroma" cleaner

The advantage of this type is that there is no moisture inserted in the cleaner, as is usually the practice, and it therefore requires no attention. The switch and motor are entirely insulated from the casing, and there is a very large outlet for the air. To use the cleaner as a blower, the paper bag is removed, and the end covers

are interchanged. The price is £7 17s. 6d., and the cleaner is obtainable from the manufacturers, Messrs. ARTHUR MORRIS AND CO., 46, Commercial Street, E.1.

A Petrol-electric Generator Unit

B.E.N. PATENTS, LTD., 92, Tottenham Court Road, London, W.1, inform us that they are marketing a new petrol-electric generator unit. The engine and generator are directly coupled

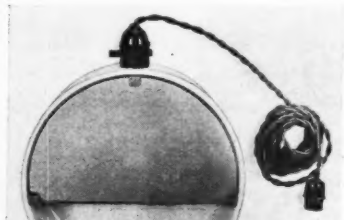


The B.E.N. petrol-electric generator with sides removed

by an insulated flexible coupling disc, designed to transmit power silently and without vibration. The output at 1,600 r.p.m. is 1,500 W at 220 V.

An Illuminated Toilet Mirror

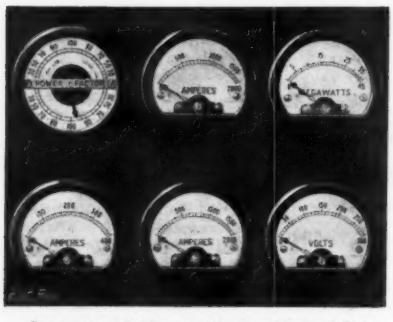
The latest product of MESSRS. MELVIN, LTD., 17, Leighton Place, Kentish Town, N.W.5, is an electric toilet mirror, bearing the name "Mistless" and priced at 17s. 6d. without lamp. The illumination of the mirror is so arranged that it gives an evenly diffused light over the face, without glare and shadow, while the warmth from the lamp keeps the mirror free from the condensation of moisture. The frame, which is 10 in. in diameter and 3½ in. deep, is finished in white cellulose, the ¼-in. plate-glass mirror being mounted on chromium-plated fittings. The switch holder is in ebony black finish with an easy push bar action. Eight feet of flexible cord with an ebony black adaptor are supplied.



The "Mistless" toilet mirror

Small-case Switchboard Instruments

The problems of economy in space and convenience in grouping are simplified in installations where protective relays are mounted on a separate board. To obtain in all cases the utmost gain in both directions the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, has developed an extensive range of small-case switchboard instruments. The panels are 17 in. in overall width, with 15½ in. surface width between beadings. The instruments have dials 3½ in. in diameter, external diameters of approximately 4¼ in., and scales 4 in. in length. The working parts are similar to those used in the company's 8 in. dial instruments, and all models, except those of moving iron d.c. pattern, comply with B.S.S. for Grade I instruments. Moving-iron d.c. instfuments are liable to additional errors of about one per cent.



A group of six small-case Metro-Vick instruments

The standard instruments are spring controlled, with externally operated zero adjusters; in the moving-iron pattern all ammeters and voltmeters up to 250 V are available with gravity control at a reduced price. The instruments are provided with very strong permanent magnets to avoid difficulties due to stray fields. The instruments, which are supplied in cases of black moulded "Bakelite," may be either of the flush or projecting pattern. The scales are boldly marked, and the position of the pointer can be easily seen from a distance of 30 to 40 ft.

The range of instruments includes moving-coil ammeters and voltmeters for d.c. circuits, moving-iron ammeters and voltmeters for a.c. or d.c. circuits, power factor meters, indicating wattmeters, reactive kVA meters, frequency meters, synchroscopes, and integrating watt-hour meters all for single-phase and polyphase a.c. circuits. The ammeters are supplied as either single-range or multi-range instruments, and any of the instruments can be provided with a strong teak case of desk pattern for test and laboratory use.

"Telacite" Ceiling Roses

MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, are now making "Telacite" ceiling roses with three-plate porcelain interiors as well as with two plates. The price is 7s. 4d. a dozen for the three-plate type as compared with 6s. per dozen for the ordinary two-plate type.

Portable Egg Testing and Candling Lamp

The "Magnet" electric egg testing and candling lamp has a specially designed head with parabolic reflector to concentrate the light on to the egg testing orifice. The latter is lined with a renewable felt and leather ring.

The standard "Magnet" egg tester can be used either on a table or a wall, or clipped to the sides of packing cases. Introduced primarily for testing eggs in incubator trays, the new portable model has the egg testing hood attached to a substantial wooden handle, enabling the apparatus to be introduced beneath the trays.

As in the case of the standard model it is designed for use with a 40- or 60-W lamp, or it can be fitted with a special adaptor to take a 6- or 12-V automobile lamp where a mains supply is not available. The price of this useful testing appliance is 18s. 6d.

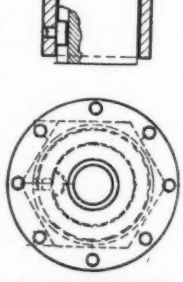
The "Magnet" portable egg testing lamp

Axle Bearing Protection

Comparatively little attention is given to the fact that axle bearings are frequently called upon to carry all or part of the load current between third rail or trolley wire and the earth rail. If the bearing is functioning correctly, the journal is insulated from the bush or pad by a film of oil, which is broken down by the current flowing through the bearing. This causes undue heating of the bearing and erosion of the journal and bush, and may lead to breakdown.

A remedy for these defects are earthing brushes. These, bearing on the axle or on a specially arranged bronze slip-ring clamped to the axle, may be lightly insulated from the frame and be connected to one terminal of the motor, in which case the bearing is relieved of all current, and the potential between journal and bush is zero. Alternatively, the earthing brush may be supported from the bearing housing and, bearing on the axle, form a low-resistance shunt path for the current past the bearing, the potential between journal and bush then being about 0.3 V. The latter arrangement is very simple and has been found very effective in service.

These brushes are particularly suitable for ball- or roller-bearings, as current flow in these types of bearings is detrimental.



An earthing contact brush-holder

THE SYNTHETIC CARBON AND ENGINEERING CO., LTD., Colindale Avenue, N.W.9, has developed a special earthing brush holder to facilitate their use on standard equipment. Fitted with the "EN 19" grade of brush, it has a continuous current-carrying capacity of 50 A, when used in conjunction with a bronze slip-ring on the axle, and has a continuous current-capacity of 40 A per sq. in. when fitted with the "S T" grade of brush, bearing directly on the steel axle. The necessary supports or brackets are usually designed for each specific case.

New Books

Piles et Accumulateurs pour Auto, Radio, etc. By Dr. H. H. U. Cross. Translated and adapted by M. A. Gegout, Paris. Pp. 160; fig. 63. Paris and Liége: Librairie Polytechnique Ch. Beranger. Price: 25 fr.

It is a tribute to the author that, in deciding to provide the French public with a book on this particular subject, he, as a foreigner, had no difficulty in finding a leading French publishing house prepared to undertake the printing and publishing of this work, which has a special preface by Professor d'Arsonval, Member of the Institut de France and of the Academie de Médecine.

The book deals in simple language with all the details of dry batteries and accumulators, both of the lead and nickel-iron varieties. A somewhat new departure is made by the inclusion of a chapter on lead-zinc accumulators in which some of the technical features of the battery devised by M. Pouchain, and which has lately attracted considerable attention in Italy and France, are outlined, as well as its advantages and drawbacks. Another chapter that is of interest in view of the ever-advancing progress of medical electricity is the one devoted to the use of batteries, both primary and secondary, in hospitals.

From the practical point of view the final three chapters should prove of great value to those persons in France and French-speaking countries whose job it is to handle accumulators. In one of these the various methods of recharging batteries are dealt with at length, and the last two cover the repair of accumulators.

The book is well illustrated by line drawings and half-tones—albeit one or two of the latter, particularly the one of the combined engine and dynamo on p. 82, appear to be a little ancient.

Principles of Electromagnetism. E. B. Moullin. Pp. viii.+ 279. Oxford: University Press. Price 17s. 6d.

This book is intended primarily for students studying for a degree in electrical engineering and its purpose is to provide them with that knowledge of the mathematical theory of electromagnetism which they will need when they come to study dynamo-electric machines, the apparatus of radio-telegraphy or any other of the many branches of electrical engineering which depend on applied electromagnetism. To such students the book can be confidently recommended, but there are many others—teachers and practising engineers—to whom it will prove useful. The author modestly disclaims any originality in his matter, but his treatment is characteristically stimulating and free from dogmatism.

The order of the contents follows the classic treatment, the first chapter commences with the law of inverse squares as applied to magnetic poles, thence to magnetic shells, to the calculation of magnetic fields due to circuits of various forms and finally to self-inductance. The second chapter deals with induced e.m.f., with mutual inductance, and with eddy currents in conductors and in iron sheets. The third chapter treats magnetic fields containing iron, but it is not part of the author's scheme to include a discussion of the properties of ferro-magnetic substances.

The second half of the book is devoted to the equations of electromagnetism leading up to a treatment of such problems as the distribution of alternating currents in conductors and including a discussion of the vector potential of a magnetic field and the applications of this conception to the solution of the different problems connected with the distribution of magnetic fields set up by the currents in conductors lying between iron surfaces or in slots. The final chapter is devoted to Maxwell's equations. Each chapter is followed by a number of useful exercises. The treatment throughout is lucid and sound and can be followed easily by anyone who has a fair acquaintance with the elements of electricity and magnetism and of mathematics.

Electric and Magnetic Fields. By Stephen S. Attwood, Assistant Professor of Electrical Engineering, University of Michigan. Pp. 314+xi. London: Chapman and Hall, Ltd. Price 21s. 6d.

Most teachers who are concerned with classes in which instruction is given in electrical engineering up to the standard necessary for a degree have realised that a deeper and more precise knowledge of magnetism and electricity is necessary than is contained in the usual preliminary course in physics. Owing to the increasing importance of high-frequency and high-pressure work in electrical engineering, this need is becoming more acute and this work is designed to provide a course of instruction of a suitable type.

The more important contents of the book comprise studies in electric fields, magnetic fields, ferro-magnetic fields, and combined electric and magnetic fields. In the section on electric fields, in addition to a treatment of the usual mathematical theorems, much stress is laid on a method of mapping fields based on the fact that equipotential lines and flux lines are mutually at right angles. Practice in the use of this method would appear to be valuable as a training in the visualisation of electric fields resulting from charges on conductors which depart from simple geometrical forms. It is noteworthy that, as a unit of electric flux, the author uses the "line" rather than the "tube," there being 4π lines from unit charge as in the convention usual when dealing with magnetic fields.

In the section dealing with magnetic fields due to currents, a number of cases not usually investigated, notably the case of a rectangular coil, are treated. An important feature of the book is the balance which is struck, in the parts dealing with electricity at rest and in motion, between the actions occurring in the conductor and the actions occurring in the dielectric. Treatment of the former is on usual and well-known lines, but the treatment of the latter contains many features of interest which are worthy of study. Varied, and in some cases unusual, examples are given at the end of each chapter, but their utility would be increased if answers had been included. The book is clearly written and can be well commended.

Photo-Cells and Their Applications. By V. K. Zworykin and E. D. Wilson. Pp. 331; figs. 180. 2nd Edition. London: Chapman & Hall. Price 18s. 6d.

The photo-cell is undergoing such rapid evolution and development that any treatment of it in a text-book must quickly become out of date. Thus it is that in two years the authors of "Photo-cells and Their Applications" have been obliged to add five new chapters to the original edition, and considerably to augment the original text. The result is a book which is both informative and up to date, and both the theoretical and the practical sides of the subject have been ably dealt with, the very numerous illustrations and diagrams assisting largely in the work. Features of especial interest at the present time are the photo-cell in photometry and colorimetry, in sound recording for the motion picture, in facsimile transmission and television. Each of these subjects is dealt with at length.

We are glad to see the distinction drawn by the authors between the current yielded by a photo-cell for a given amount of light—as much as 100 micro-amperes per lumen of light flux in recent cells—and the rate of change of output with change in the incident light flux. With ease of amplification to-day, improvement in the latter quality is of the utmost importance, and considerable advance may be looked for. One wonders whether in view of recent advances quite enough attention is allotted to selenium, an element that is still likely to reveal unexpected qualities.

Short Wave Wireless Communication. By A. W. Ladner, and C. E. and C. R. Stoner. Pp. X+348. 201 illustrations. London: Chapman and Hall, Ltd. Price 15s.

A great deal of information about short-wave signalling has been published during the last two or three years, but this is the first text book we have seen on the subject. It certainly fills a gap, and fills it well. The authors have gained their experience with the Marconi Company, which was the pioneer of that beam signalling on short waves, which, eight years ago, changed the whole outlook of radio communication, and we are glad to read their tribute to Mr. C. S. Franklin.

The book is an excellent summary of the present state of knowledge and practice of short wave working, though it naturally deals more fully with the practice of the Marconi Co., than with that of others. It gives, however, good bibliographies at the ends of chapters so that other practice may be referred to for fuller explanation if required. The whole question of wave propagation is dealt with well, particularly the part on attenuation, and various forms of short wave transmitters, receivers and aerials are fully considered.

* * *

Shorter Notices

"*Mechanical World* Pocket Book," 1933. Pp. 361. Manchester: Emmott & Co., Ltd. Price 1s. 6d.—In view of recent developments an entirely new section on i.c. engines has been prepared. Every aspect is touched upon, including the important one of fuel. The sections on steam turbines and boilers have been supplemented by information on piping for the high temperatures and pressures employed in modern steam plant. The section on transmission of power has been completely revised and brought up to date. Another addition is a comprehensive section on bucket elevators.

"The Practical Electrician's Pocket Book," 1933. Pp. 578. London: Odhams Press. Price 2s. 6d.—The operation, construction and methods of connecting mercury-arc rectifiers are explained in one of three new sections, the other two additions being a summary of the grid scheme and a technical description of various types of synchronous electric clocks.

"Windmills for the Generation of Electricity," by C. A. Cameron Brown. Oxford: Institute of Research in Agricultural Engineering. Price 1s.

"Light and Power on the Farm," by W. H. Jones. Aberystwyth: Department of Agricultural Economics, University College of Wales. Price 6d.

"Statistique de la Production et de la Distribution de l'Energie Electrique." Paris: Imprimerie Nationale.

"Ubungsaufgaben mit Läsungen aus Abraham-Becker Theorie der Elektrizität." Volume I. Ninth edition. Leipzig and Berlin: Verlag von B. G. Teubner. Price Rm.1.

"Automobile Engineering." Edited by H. Kerr Thomas. Vols. I, II, and III. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. each.

"Textile Electrification," by Dr. Ing. Wilhelm Stiel. Translated by A. F. Rodger. London: George Routledge & Sons, Ltd. Price 3 gns.

"Alternating Current Electrical Engineering," by Philip Kemp. London: Macmillan & Co. Price 15s.

In the Courts

IN the King's Bench Division on March 8th, Mr. Justice Du Parcq gave judgment in favour of Mr. Ivor Griffiths, Pangbourne, for £500 and costs against E. R. Ingram & Co., electrical engineers, who did not appear.

The plaintiff was an electrical engineer and manager of the defendants' branch at Pangbourne. His case was that in July, 1932, he deposited with the defendants £500 under the terms of an agreement that the firm should be formed into a limited company, that he should be allotted 500 £1 ordinary shares in the new company, and that he should be appointed a director and manager of the Pangbourne branch. The new company had not been formed, however, and he claimed the return of his money.

An affidavit of defence stated that the delay in the formation of the new company had been caused by the defendants having undertaken a building contract.

A Welding Patent Dispute

The hearing of the action by Murex Welding Processes, Ltd., against Weldrics (1922), Ltd. (see our last issue, p. 352), was concluded this week. In giving judgment Mr. Justice Farwell reviewed the evidence and said he had come to the conclusion that the plaintiffs' patent was invalid for want of subject matter. He did not think that the adoption by the plaintiffs of the extrusion process was an inventive step.

If it was necessary he would come to the conclusion that the defendant had not infringed the plaintiffs' letters patent. The action would be dismissed.

Contractors' Successful Claim

Mr. Justice Clauson, in the King's Bench Division on March 13th, heard an action by Messrs. Anderson, Angell & Co., electrical engineers, against the King Edward VII Memorial Eliot Hospital, Haywards Heath, to recover £567 8s. 3d., the balance alleged to be due for work done in connection with an electrical installation at the hospital. The defendants alleged that certain of the work was defective, and counterclaimed for a set-off.

Mr. Levy, for the plaintiffs, said that the claim originally was for £609 15s., but reductions had been agreed upon in some minor respects. The main dispute was with reference to the cable installed, which the defendants alleged was not in accordance with the contract. About four miles of cable was put in, and the defendants claimed that this should be completely withdrawn and replaced. The cost of this work would be about £300.

Mr. Blanco White, on defendants' behalf, said that according to the contract the work had to be done to the satisfaction of the architect and carried out on thoroughly sound engineering lines, and in accordance with the I.E.E. rules; the insulated wires were to be of the best C.M.A. quality. The architect assumed that the cable was obtained from a member of the C.M.A. and was not informed that it was purchased from a Belgian firm. The cable was tested at Faraday House and was found to have an insulation resistance of only 434 megohms per mile against the C.M.A. figure of 1,250. It was tested again in February last when the resistance was found to have fallen to 273 megohms.

Mr. Levy said that a test made two years after installation was useless. The plaintiffs' case was that the whole trouble which arose regarding the cable was due to dampness.

Mr. R. M. F. Huddart, the defendants' architect, examined, said he stipulated that the materials used were to be of the highest quality. He denied that the building was exceedingly damp when the wiring was being done and that the whole trouble was due to this.

Evidence was given by Mr. A. T. Morris, the superintendent of Faraday House Testing Laboratories, that the wire put in by the plaintiffs was not 600-megohm grade best quality as provided for by the contract. He did not think that a good quality cable would deteriorate in two years through damp. He attributed the trouble to bad manufacture.

Mr. F. C. Polden, managing director of Francis Polden & Co., Ltd., electrical contractors, Cannon Street, E.C., said that in November, 1930, he examined the electrical system of the hospital and remedied certain defects due to faulty installation. He submitted part of the wire to Faraday House. Continental wire was inferior to British. The cost of rewiring the new wards and the massage and X-ray departments would be £300. He agreed that in a good many places the wires were found to be suffering from damp; the wiring should not have been completed until the building had dried.

Mr. H. Bourne, of Albion T. Snell & Partners, also gave evidence for the defendants.

The plaintiffs called Mr. F. C. Raphael, consulting electrical engineer. He said that in December last he inspected the electrical installation at the hospital. He found that several of the switches and wall sockets were damp and others were crusted with rust where they had been damp. The result of that would be that the insulation would gradually fail and the cable would break down. The quality of the cable had very little to do with it. The cable conformed with the British Standard Specification.

Mr. H. G. Shepherd, foreman electrician in charge of the installation work, said there was a flood in October, 1928, and the foundations of the hospital were under water. The building was still damp when the job was completed.

Mr. W. H. Shipman said his company supplied the cable which was guaranteed to conform to the British Standard Specification, and that it was tested and passed before it left the works.

Mr. H. Angell, a partner in the plaintiff firm, denied that the work was "badly scamped," but agreed that deviations were made from the specification to suit local circumstances.

At the conclusion of counsels' addresses his Lordship said that the evidence satisfied him that while there were defects in the cable it was by no means clear that they were due to the wire not being up to specification and not to dampness. He felt bound to hold that the defendants had failed to establish their particular defence to the plaintiffs' claim.

Mr. Levy stated that the parties had come to an agreement with regard to the other items challenged. The figures would be halved, and he asked for judgment for £523 13s. 9d.

Judgment was entered for the plaintiffs for £523 13s. 9d., with four-fifths of the costs of the action. There was no order as to costs on the defendants' counterclaim.

Yagerphone, Ltd.

In the Companies' Court on March 13th Mr. Justice Maugham again had before him a petition by Hart Bros., of Ponders End, electrical manufacturers, for the compulsory winding up of Yagerphone, Ltd. Mr. Buckmaster appeared for the company, and after discussion it was agreed that notice should be given withdrawing a declaration of solvency which had been made, and that notices should be sent out for a voluntary winding up and that joint liquidators should be nominated.

On that understanding the motion stood over for three weeks.

Shares in a Supply Company

On March 9th, before Mr. Justice Du Parcq in the King's Bench Division, Mr. Oliver W. Porritt brought an action against Mr. George Petrides.

Mr. Singleton, K.C., for the plaintiff, stated that in November, 1929, the defendant agreed to buy shares in Thomas Wilkinson (Arnside), Ltd., electrical engineers, in which the plaintiff and Mr. Wilkinson were the sole shareholders. The company had applied to the Electricity Commissioners for a special order to supply electricity in certain parts of Westmorland, Lancaster, and the West Riding of Yorkshire. Defendant paid £9,000 for the shares and agreed to pay a further £6,000 if the Order was obtained. In January, 1931, it was mutually agreed between the parties that the covenant as to the payment of the £6,000 should be satisfied by the allotment of 4,000 shares in a company to be formed and by payment of £2,000 within seven days of the Order being granted. The Order was obtained but the defendant had failed to pay the £2,000.

His Lordship having heard the evidence for the plaintiff gave judgment for him for £2,000 and costs.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on March 8th Mr. Liddall asked the Minister of Transport whether, now that the grid scheme was almost completed, he would, in order to provide work for the unemployed, take the necessary steps to extend the benefits of electric lighting to all towns and villages throughout the country.

Mr. Stanley said that the duty of adequately developing electricity supply within their respective areas rested upon the various local authorities and the companies concerned. Development was steadily proceeding. His information was that generally speaking authorised undertakers were alive to their duties in this respect and it was not unreasonable that they should have regard to the adequacy of the probable demand. The position was, however, closely watched by the Electricity Commissioners.

The Cost of the Grid

Mr. Levy asked the Minister of Transport what was, or would be, the total capital expenditure on the construction of the electricity grid; and when the work would be completed.

Mr. Stanley said he was informed that on the figures and information available it appeared that the total capital expenditure on the construction of the grid would be approximately £27,000,000, exclusive of interest during construction, and that the work would be substantially completed during the current year.

Electricity Supply in Yorkshire

On March 9th Major Carver asked the Minister of Transport what progress was being made to establish a supply of electricity for lighting and power in the rural districts of Howden, Riccall, and Pocklington, in the East Riding of Yorkshire.

Lieut.-Col. Headlam, who replied, said that Howden and Riccall were both within the area of the North Lincolnshire and Howdenshire District Co., whose statutory powers only became operative in January of this year. Pocklington was in the area of the Buckrose Light & Power Co., whose powers became operative in May, 1931. He was taking steps to ascertain the actual progress towards providing supplies of electricity made by these companies.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Ediswan Hotel Lighting

The Rozel Hotel, Weston-Super-Mare, has just been equipped with a modern lighting installation. The result, as will be seen from the accompanying illustration, has proved very satisfactory. Ediswan "Harcourt" fittings are employed including the new "Fawleya" pendants. The installation was designed by the Edison Swan Electric Co., Ltd., and executed by Messrs. G. V. Court, of Weston-Super-Mare.

Ediswan fittings in the Rozel Hotel

Establishing a Works

For the assistance of the manufacturer seeking a new factory in or around London, Messrs. Leopold Farmer & Sons, 46, Gresham Street, E.C.2, have compiled a booklet entitled an "A.B.C. Guide in Establishing a Works." Besides a number of general notes, particulars are given of the charges for electricity and other services, rates, and the Factory and De-rating Acts, a large scale map of London being also included.

Art in Industry

An exhibition of contemporary British art in industry is to be held by the Royal Academy of Arts, in collaboration with the Royal Society of Arts, at Burlington House, London, from January to March, 1935. One of the principal aims of the exhibition is to impress on the public both the importance of beauty in the articles it purchases and the fact that British manufacturers are capable of supplying such articles.

Hire-purchase in the West of England

Particulars have just been received of an arrangement between the United Dominions Trust (Electric), Ltd., and the S.W. & S. & S.W.P. Circles of Electrical Contractors, whereby facilities are made available for the disposal of equipment and the installation of wiring on deferred terms throughout the areas of the Shropshire, Worcestershire and Staffordshire and the South Wales Power Companies. The arrangement is to be supplementary to the assisted wiring and hire-purchase schemes which the supply authorities have had in operation for some years, so that the contractors may be in a position to offer credit for installations and equipment of which the nature and price have hitherto prevented its being granted under the existing scheme. The agreement will be between the contractor and his customer, the trust company acting purely in a banking capacity.

Frozen Out

In an advertisement recently published in *Electrical Merchandising* the General Electric Company of America makes the following remarkable statement:—

"170 manufacturers of electric refrigerators have come and gone; 25 were absorbed, 34 cannot be reached by mail, 111 have discontinued production. This record of "orphan" electric refrigerators was compiled through a survey by *Electric Refrigeration News*."

The advertisement gives a full list of the names of these companies.

Electrical Production in America

The following statistics relating to the value of orders received by its members during December last (with comparisons with the corresponding month of 1931 in parentheses) are given in the National Electrical Manufacturers' Association's *Survey* for February—A.c. electric motors (1-200 h.p.), $593,540 ($1,330,210); d.c. motors (1-200 h.p.), $133,950 ($354,236); fractional h.p. motors, $650,587 ($1,465,398); power switchgear equipment, $76,321 ($234,394); electric furnaces $22,453 ($77,388). Generally speaking, there were more companies reporting last year than in 1931.

New Electricity Showrooms and Offices

The Cardiff Corporation is considering converting the fish market into a showroom for the Electricity Department.

The Isle of Wight Electric Light & Power Co., Ltd., has opened larger premises, including an up-to-date showroom, in Regent Street, Shanklin.

The Reigate Town Council has decided to draw up a scheme for the establishment of showrooms for the Electricity Department. It is proposed at first to confine activities to the hire and hire-purchase of kettles, electric irons, cookers, and radiators.

A Ministry of Health inquiry was held at Wrexham last week into a proposal of the Electricity Department to acquire premises for extensions.

Electric Cooking Utensils

A little booklet entitled "Ah! Now I Understand," and "dedicated to the intelligent salesman and thoughtful householder," has been sent us by Messrs. Hague & McKenzie, Ltd., Pyramid Works, Sloan Street Parade, Birmingham. The publication is the outcome of the last E.D.A. Sales Conference and the criticism made there on the selling of electric cooking utensils.

Duties on Diamond Dies

The Treasury has approved a recommendation of the Import Duties Advisory Committee that unmounted diamonds for use in wire-drawing dies should no longer be exempted from the 10 per cent. general *ad valorem* duty under the Import Duties Act.

Indian Agencies Wanted

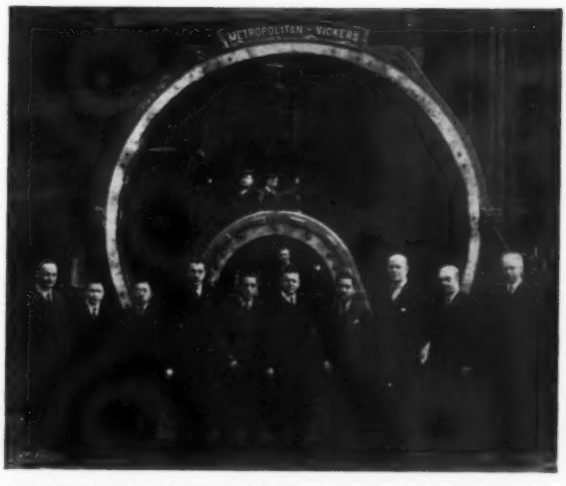
A Karachi (India) firm of importers and exporters wishes to obtain British agencies for all kinds of electrical goods. We shall be pleased to forward communications from manufacturers.

A Soviet-built Generator for the Dniepr Station

The first Soviet-built generator for the Dniepr hydro-electric station has been assembled and was tested a few days ago. Five generators of foreign manufacture are already at work. The test, which lasted an hour and twenty minutes, is reported to have been successful. The generator was produced by the Electrosila Works in Leningrad, and was assembled by Soviet workers without foreign assistance.

Visits to Metrovick Works

On Monday Mr. Matsuoka, Japanese League of Nations representative, paid a visit to the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd. After a tour through the shops, the visit concluded with a high-frequency and power-frequency high-voltage display, and Mr. Matsuoka was presented with an album containing photographs of various members of the Japanese Royal Family who had visited the works from time to time. Mr. Matsuoka stated that the works were very much more fully employed than any he had seen in his visits on the Continent.



Mr. Matsuoka and other visitors at the Trafford Park works on Monday

A number of colliery managers and engineers also visited the

Trafford Park works on Saturday. The party mustered nearly 100 and represented the Lancashire, North Wales, North Stafford and South Staffs and Warwickshire branches of the National Association of Colliery Managers. The visitors were shown electrical apparatus designed specially to meet mining requirements, but perhaps principal interest centred on the Metrovick brake governor and its application not only to electric winders but to existing steam winding engines. Mr. Scholes, president of the Lancashire Branch, proposed a vote of thanks to the company, which was seconded by Mr. Maynard, of the North Staffs branch, and replied to by Mr. Metcalfe.

The German Radio Industry

Discussing the situation of the German radio manufacturing industry, a Frankfort newspaper points out that since the period of wild promotion has been overcome there has been a large measure of concentration, and the ten largest companies now represent about 80 per cent. of the total production. About one-half of the total sales is effected through the wholesale merchants and the other half of the business is done directly with the retailers.

For Sale

Walsall Corporation has for sale motors, meters, and scrap metals.

Mr. Henry J. Shaw is to sell by auction on March 22nd wireless and electrical goods and accessories.

(See our classified advertisements.)

Two E.D.A. Luncheons

About 200 people were present at the annual luncheon of the British Electrical Development Association (Northern Counties Area) held in Newcastle-upon-Tyne on March 9th, Mr. C. W. Salt, Area chairman, presiding. Among those present were Catherine Countess of Westmorland, Ald. J. W. Telford (Sheriff of Newcastle), Mr. R. P. Sloan, Col. F. R. Simpson, Mr. D. Maxwell Buist, Miss Sloan, and other representatives of municipal authorities and electrical under-

A new "Premier" kettle showcard

takings in the North. Lady Moir (President, E.A.W.) proposed "The Association," and said that in other parts of the country the North of England was held up as an example of one of the most efficiently electrified areas in the country. Replying, Lord Meston, president of the Association, remarked that although his association with the electrical industry had been a short one, it was long enough for him to be fascinated by its efficiency, enterprise and enthusiasm. E.D.A. received a great deal of assistance and goodwill from the great electrical undertakings in the Northern area, municipal and company. Mr. C. W. Salt proposed "Our Guests," and urged that greater efforts should be made to make the country electrically minded. There were still millions of homes without electricity. During the proceedings Mr. A. C. Cramb (Director of E.D.A.) presented prizes to the winning competitors in the local section of the National Public Speaking Competition.

The fourth annual meeting of the North Midland Area of the British Electrical Development Association was held at Bradford on March 8th, Mr. Thomas Roles presiding. He was supported by Mr. C. H. Cox, chairman of the E.D.A. Council, and Mr. A. C. Cramb, director of E.D.A. At the luncheon which followed Ald. T. Hey, J.P., of Halifax, submitted the toast of the Association, and Mr. C. H. Cox, in responding, claimed that the E.D.A. had more than justified its existence, and urged a fuller recognition of its value and importance to the industry by all undertakings. Mr. R. Roles, on behalf of the Area Committee, promised a continuance of co-operative service in the future. The gathering numbered eighty, and was thoroughly representative of the industry in Yorkshire and Lincolnshire.

Hull Electricity Showrooms

On Tuesday last the new offices and showrooms of the Hull Corporation Electricity Department were formally inaugurated by Lord Irwin. The Sheriff of Hull (Ald. Benno Pearlman), who is also chairman of the Electricity Committee, was largely responsible for the initiation of the showroom scheme; the previous accommodation in the city became unsuitable owing to the rapid development of the undertaking. Lord Irwin, in his speech, mentioned that the proportional increase in the number of Hull consumers during the last two years was almost double that shown for the country as a whole, while the number of consumers was more than doubled in the last three years. At a luncheon which followed the guests included Sir Andrew R. Duncan, Sir John Brooke, the Lord Mayor and Lady Mayoress of Hull, the Lord Mayor of Sheffield, and Mr. Johnstone Wright, Central Electricity Board. Sir John Brooke and Sir Andrew Duncan were among the speakers.

Electrical Machinery Exports in February

The following figures relate to the exports of electrical machinery from Great Britain during February, notes of increases or decreases being made as compared with the corresponding month of last year :—

	Quantities.		Values.	
	Feb., 1933. Tons.	Inc. or dec. as compared with Feb., 1932. Tons.	Feb., 1933. £	Inc. or dec. as compared with Feb., 1932. £
European countries	213	– 623	41,104	– 69,161
Japan	—	—	62	– 157
South American countries	61	– 34	10,309	– 7,258
South and South-West Africa	407	+ 289	54,378	+ 32,731
British India	391	– 129	62,033	– 6,388
Australia	38	– 108	7,388	– 17,780
New Zealand	16	– 23	3,203	– 6,398
Canada	26	– 34	5,165	– 3,200
Other countries	252	– 69	30,776	– 17,694
Total	1,404	– 731	£214,418	– £95,305

In studying our usual monthly table below referring to this country's overseas trade generally readers are reminded that February was two working days shorter than January and a day shorter than February last year.

British Overseas Electrical Trade in February

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Feb., 1933.	Inc. or dec. as compared with Jan., 1933.	Inc. or dec. as compared with Feb., 1932.	Electrical imports for Feb., 1933.	Inc. or dec. as compared with Jan., 1933.	Inc. or dec. as compared with Feb., 1932.	Electrical re-exports for Feb., 1933.	Inc. or dec. as compared with Jan., 1933.	Inc. or dec. as compared with Feb., 1932.
Insulated wires and cables	£72,864	– £26,251	– £35,921	£14,081	– £3,992	– £46,511	£27	– £233	– £188
Electric carbons	1,530	– 232	– 1,625	11,797	– 2,894	+ 5,764	—	– 12	– 563
Arc lamps and searchlights	170	– 2	– 226	411	+ 106	+ 411	—	– 28	– 39
Incandescent lamps	33,574	+ 1,286	+ 6,785	10,148	– 6,639	+ 984	990	– 423	+ 518
Other lighting apparatus	21,431	– 1,090	– 6,118	15,356	– 4,071	– 4,705	5,659	+ 2,096	+ 4,635
Batteries and accumulators	57,564	– 3,090	+ 19,807	1,833	+ 153	– 15,493	46	– 177	– 324
Meters and instruments	20,696	+ 2,297	– 7,151	26,607	+ 587	– 23,232	308	+ 185	+ 33
Unenumerated electrical goods and apparatus	70,872	– 1,010	– 16,160	33,941	+ 796	– 50,090	2,895	– 1,456	+ 19
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	19,888	+ 5,025	+ 7,489	69	– 26	– 148	5	+ 5	+ 5
Submarine telegraph and telephone cables	3,054	– 1,149	– 2,289	—	—	—	—	—	—
Telegraph and telephone apparatus	160,892	– 84,494	+ 6,737	37,702	– 8,618	– 5,612	6,125	– 3,249	+ 2,362
Electrical Machinery—									
Railway and tramway motors	1,844	+ 1,730	– 7,713	—	—	—	—	—	—
Other motors and generators	112,783	+ 52,627	+ 16,268	—	—	—	—	—	—
Unenumerated electrical machinery	99,791	+ 8,563	– 103,860	14,066	– 2,155	– 34,411	3,274	– 1,121	– 8,586
Total	£676,953	– £45,790	– £123,977	£166,011	– £26,753	– £173,043	£19,329	– £4,413	– £2,136
Increase or decrease for the first two months of the year	Exports. – £109,565			Imports. – £278,727			Re-exports. + £1,928		

Trade Announcements

Morris Commercial Cars, Ltd., inform us that they have commenced the production of a new range of amply powered 6-cylinder vehicles, which comprises 30-cwt., 2-ton, and 3-ton models. One of the most important features is that both normal- and forward-control types are offered in the 30-cwt. and 2-ton short wheelbase models.

The business address of Mr. M. P. Dalton, B.E., production consultant, is now 65/66, Chancery Lane, W.C.2. Mr. Dalton, who was formerly manager of the Post Office factory, Dublin, asks for catalogues and price lists of machine tools, small tools, and raw materials.

The Belgrave Electric Company, 24, Belgrave Road, S.W.1, announces that it has commenced the manufacture of real and imitation wax candle tubes in all sizes and colours for use with modern and period lighting fittings.

The address of the Scottish office of Messrs. Pritchett & Gold & E.P.S. Co., Ltd., has been changed to 93, Dunlop Street, Glasgow, C.1 (telephone: Central 4886).

Messrs. Drake & Gorham, Ltd., will open a branch office on March 27th at 14, Commercial Street, Hereford, and they ask for manufacturers' catalogues.

Walsall Conduits, Ltd., is moving its Nottingham branch to larger premises, and on and after March 22nd the address will be 22, Castle Gate, Nottingham. (Telephone No. 42438.)

Messrs. F. G. Ride & Co., wholesale electrical suppliers, are removing to Sunlight House, Quay Street, Manchester.

Irish Free State Electrical Imports

A slightly more active tone prevailed in the electrical trade in the Irish Free State during January last, the imports of electrical machinery, fittings, and apparatus during the month amounting to £58,595, as compared with £53,748 in January, 1932. The appended tables giving the details of the imports show that the principal advance was in unclassified electrical goods:—

	January. 1932.	1933.
	£	£
Electrical machinery	14,707	14,877
Electric wires and cables	6,206	2,530
Wireless sets and parts	16,571	20,316
Electric lighting accessories, fittings and parts	3,332	4,426
Other electrical goods	12,500	16,384
Copper wire	432	62
Totals	£53,748	£58,595

The Refrigerator Market in Peru

Notwithstanding the economic and commercial crisis which has afflicted Peru during the past few years, a Department of Overseas Trade report states that the general opinion of importers is that the market for domestic electrical refrigerators is an increasing one since the public has been educated to appreciate their importance.

A Vacuum Cleaner Display

The accompanying illustration shows a window display set which British Electric Domestic Appliances, Ltd., has prepared for supply to all its authorised dealers throughout the country. As will be seen, a special feature is made of the "Mary Ann" electric vacuum cleaner.

A "Mary Ann" cleaner window display

Electricity on the Poultry Farm

The North-Eastern Electric Supply Co., Ltd., holds exhibitions annually during the poultry-rearing season, and eggs are hatched in electrically heated incubators prior to and during the exhibition, so that chicks are seen at various ages from one day to two months; birds suitable for killing are kept ready to demonstrate the Bingham poultry plucker. A complete range of brooders includes home-made brooders to demonstrate the ease of conversion of existing oil-heated brooders to electric heating by means of "Stuwa" heating boards (manufactured by Stephen's Trade Corporation), and battery brooders for day-old chicks by Messrs. Edwin Chambers, Ltd., and for day-old and month-old chicks by Messrs. Uttley, Ingham & Co., Ltd. A 720-egg Hearson cabinet-type incubator and a Chambers' all-metal 150-egg size incubator are used for incubating, while "Curfew" incubator

An exhibition of electrically heated incubators, battery brooders, &c., at Carliol House, Newcastle-upon-Tyne

conversion sets, water heaters, and egg-testing lamps are displayed. For the horse breeder and farmer a range of small motors, drilling machines, and a Cooper-Stewart "Clipmaster" and "Shearmaster" are available for inspection; and a 4-cwt. electrically operated sack hoist, built by the T.B.T. Electric Co., is shown in actual use.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price March 15th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£111	£3 inc.
Grade II ... ... ,,	£99	£1 inc.
Grade III ... ... ,,	£51	£1 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	7d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	8¼d. to 9d.	—
c ,, Wire, basis ... ... ,,	7¾d.	¼d. inc.
c Copper Tubes (solid drawn)... ... ,,	9¼d.	—
g ,, Bars (best selected)... ... per ton		
g ,, Sheet ... ... ,,	£61	—
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£34 5s.	£2 dec.
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£42 15s.	£1 inc.
d ,, ,, H.C. Wire ... per lb.	6¼d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¼d.	¼d. inc.
i Iron, Pig (Cleveland No. 3)... ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£12 10s.	10s. inc.
g Mercury ... ... per bot.	nom.	
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¼d.	—
p ,, ,, rolled strip & sheet ,,	10¼d.	—
p ,, ,, wire ... ... ,,	11¼d.	¼d. inc.
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. inc.
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English)... ... ... per ton	£150 to £152	£3 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	2/11	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
f James & Shakespeare.
g Edward Till & Co.
h Bolling & Lowe.
i Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The Birmingham Electric Club

There was a record number of members at the twenty-second annual dinner on Friday, at the Grand Hotel, Birmingham, of the Birmingham Electric Club, and the chair was occupied by the President (Mr. J. M. Dunkley), who, in replying to the toast of "The Club" (proposed by Dr. A. H. Railing, G.E.C.), stated that its membership was 350. Having regard to the large number of electrical engineers in Birmingham, it should be at least 500. Dr. Railing stated that the club was the first electric club to be formed in the Kingdom, and it

An effective lighting installation has recently been carried out at All Saints' Church, Luton, by Mr. P. T. King. "Holophane" reflectors are used, a dimmer being provided to reduce the lighting during the sermon

was to be commended because it had always maintained the ideals of an electric club. The task of the club should be to develop the electrical industry, and, in this connection, he mentioned that the Birmingham Corporation had set a good example by deciding to spend a quarter of a million pounds this year on mains extensions and other improvements. Mr. Howard Foulds, in proposing the toast "The City of Birmingham," spoke of the phenomenal development of the Corporation Electric Supply Department, with which he was formerly associated. Alderman J. B. Burman (Deputy-Mayor of Birmingham) responded to the toast. Mr. J. H. Parkinson (vice-President of the club) proposed "The Guests," which was acknowledged by Mr. H. N. Sporborg.

New Catalogues and Lists

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—Publication No. S.F.26 dealing with "Sirocco" fans for moderate and high pressures.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Catalogue section F(3) of British-made illuminating glassware and imitation vellum and fancy shades.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 842 describing protected-type plugs and sockets. Also leaflet No. 805 on Holmes-Reyrolle automatic traffic control equipment.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—Publications Nos. 142 and 143 relating to small "Mopumps."

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—The March number of "The Link," containing particulars of the "Mixabeater" mixer, juice extractor, &c., the new chromium "Dotlite" for bathrooms, pleating irons, &c. Also a leaflet on the "Vioray" artificial sunlight apparatus.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, N.17.—The March issue of the "Reflector," containing a number of illustrations of garage and industrial lighting installations.

G.V.D. Illuminators, Aldwych House, W.C.2.—A number of leaflets describing the "G.V.D." system of controlled lighting.

British Sangamo Co., Ltd., Cambridge Arterial Road, Enfield, Middlesex.—An illustrated leaflet on the new three coin meter.

Aurora Lamps, Ltd., Old Kilpatrick, Scotland.—Coloured leaflets relating to "Aurora" lamps.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham.—An illustrated catalogue of electric cooking and heating appliances.

Brown Brothers, Ltd., Brown's Buildings, Great Eastern Street, E.C.2.—A sample of "Solon" (Henley's) resin cored solder for which the company is agent.

Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1.—A leaflet relating to the "Benflux" reflector.

British Rema Manufacturing Co., Ltd., Halifax.—Catalogue No. G.9, describing ring roll mill and ball mill type pulverisers, and lists Nos. M.10 and 11, relating to emulsifying and mixing equipment.

Bankruptcy Proceedings

Aldersgate Radio (trading as C. Marquis & A. Lester), wireless dealers, 37, Aldersgate Street, E.C.—These debtors attended at the London Bankruptcy Court on March 10th for public examination upon accounts showing liabilities of £5,487 and assets "motor car, £30." The debtors attribute their failure and insolvency to interest on borrowed money; to this country abandoning the gold standard; to the imposition of import duties; and to their liability under guarantees given on behalf of Beam, Ltd. The examination was adjourned.

W. Rowlands, wireless dealer and electrician, 56, High Street, Bethesda, Caernarvon.—The public examination was held recently at the Court House, Bangor, when the statement of affairs showed gross liabilities of £465 and a deficiency of £407. The position was attributed to losses on goods taken in part exchange, insufficient profits to meet drawings, &c. The examination was closed.

G. D. Whitham, electrical engineer, 86, Orford Lane, Warrington, Lancs.—The public examination was held recently at the Court House, Warrington. Debtor had prepared a statement of affairs which showed a deficiency of £597. He attributed his failure to "underestimating on contracts; purchasing stock when prices were high; excessive credit; and loss on second-hand wireless sets taken in part exchange for new sets."

W. H. Talbot, radio and electrical dealer, trading as "The City Radio Supplies," Penny Street, Blackburn.—The adjourned examination was held recently at the County Court House, Blackburn, when it was stated that the deficiency amounted to £271. The previous hearing had been adjourned to allow debtor to file particulars regarding his trading. The examination was closed.

E. Taylor, electrical engineer, 86, Strathmore Road, Hinckley, Leicester.—The receiving order was made recently on the debtor's own petition, and the statement of affairs filed shows liabilities of £343 and assets of £12, leaving a deficiency of £331. The position is attributed to "loss of £100 on two contracts for 1932-33 and bad trade." At the first meeting of creditors, held recently, the case being a summary one was left in the hands of the Official Receiver as trustee.

H. L. McIvor, electrical engineer, 92, High Street, Ewell, Surrey.—The first meeting of creditors was held on March 10th at 29, Russell Square, W.C.1. A statement of affairs was submitted which showed liabilities amounting to £528, against assets of £131, leaving a deficiency of £397. The failure was attributed to bad trade and lack of capital. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

L. G. H. Cantle, electrical engineer, Woodberry Cottage, Woodland Grove, Oatlands Park, Weybridge.—Last day for receiving proofs for dividend March 24th. Trustee, Mr. H. Lever, Chiswell House, 133-139, Finsbury Pavement, E.C.

E. Gould (Gould & Co.), electrical and radio engineer, High Street, Lee-on-the-Solent.—Last day for receiving proofs for dividend March 21st. Trustee, Mr. F. H. Langmaid, 87, High Street, Portsmouth, Official Receiver.

K. Beeson, electrical contractor, 46, Main Street, Mexborough.—First and final dividend of 20s. in the £ and interest at 4 per cent per annum, payable March 13th at the Official Receiver's offices, 14, Figtree Lane, Sheffield.

K. A. Fox, radio and electrical engineer, Acle, Norfolk.—The public examination of this debtor was held recently at the Shirehall, Norwich, when the statement of affairs showed gross liabilities of £416 and assets of £6, leaving a deficiency of £410.

C. E. Wooton, electrical engineer, 10, Cemmaes Terrace, Hemel Hempstead.—Receiving order made March 2nd on debtor's own petition. First meeting March 24th at 29, Russell Square, W.C. Public examination April 12th at the Court House, St. Albans.

D. S. B. Shannon, electrical engineer, Carlton Chambers, Lichfield Road, Mere Green.—Public examination April 12th at the Court House, Corporation Street, Birmingham.

Company Liquidations

Standard Manufacturing (Wireless) Co., Ltd., 8a, Snell's Park, N.18.—The statutory meeting of creditors was held on March 10th at the offices of Messrs. Hilton, Sharp and Clarke, 14, Gray's Inn Square, W.C.1, when a statement of affairs was submitted which disclosed liabilities of £676, all due to unsecured creditors. The net assets totalled £278, leaving an estimated deficiency of £398. The creditors passed a resolution in favour of the appointment of Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., as liquidator.

Whitchurch & Pangbourne Electric Supply Co., Ltd.—Meeting April 10th at Broad Sanctuary Chambers, 11, Tothill Street, S.W., to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

Smithfield Markets Electric Supply Co., Ltd.—Winding up voluntarily. Joint liquidators, Sir George E. Leon, Bt., and Mr. W. H. Percival, 4B, Frederick Place, E.C. Claims to the liquidators by March 24th.

Eastern Counties Electric Equipment, Ltd.—Winding up voluntarily. Liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Electric Service, Brighton, Ltd.—Meetings April 7th at 6 and 7, Old Steine, Brighton, to receive an account of the winding-up by the liquidator, Mr. A. E. Orbell.

Regent Radio, Ltd.—Particulars of claims by March 31st to the liquidator, Mr. R. J. Hayward, 103, Cannon Street, E.C.

The Ross Electric Light & Power Co., Ltd.—Particulars of claims by April 7th to the liquidator, Mr. J. E. Birchall, Aldwych House, Aldwych, W.C.

Haslam & Stretton, Ltd.—Winding up voluntarily. Liquidator, Mr. G. T. Needham, Baltic House, Mount Stuart Square, Cardiff.

The Radio Electric Lamp Co., Ltd.—Winding up voluntarily.

Private Arrangement

G. S. Hall, electrical engineer, 49, Chapel Road and 14a, Warwick Street, Worthing.—A meeting of the creditors of the above was held on March 9th, when Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, submitted a statement of affairs which showed ranking liabilities of £520, all due to the trade. The net assets were estimated to realise £243, leaving a deficiency of £277. A resolution was passed in favour of the matter being dealt with under a deed of assignment to Mr. Orbell as trustee.

Dissolutions of Partnership

W. J. Marchant, electrical and wireless engineer, 2, Mount Lion, Tunbridge Wells.—Messrs. W. J. Marchant and L. F. Pearce have dissolved partnership. Mr. Marchant will attend to debts and carry on the business.

Radio & Electrical Equipment Co., radio and electrical dealers, 36, Bond Street, Blackpool.—Messrs. S. H. Schofield and W. C. Rothery have dissolved partnership. Mr. Schofield will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Bala.—Local Generation Favoured.—The Urban District Council proposes to abandon the scheme for obtaining a supply of electricity from the North Wales Power Co. and is contemplating generating its own electricity locally, probably by water power.

Barnham (Sussex). — Supplies to Smallholdings. — The West Sussex County Council Small Holdings Committee is to approach small-holding tenants to ascertain the number who would be prepared to take electricity.

Barrow-in-Furness.—Loans Sanctioned.—The Electricity Committee has received sanction to loans of £2,460 for works in connection with the extension of the supply to Swartlemoor, Penning, &c., and £20,000 for unspecified mains and services.

Mains Extensions.—Approval has been given by the Highways Committee to plans for mains extensions in Greengate Street, Robert Street, Slater Street, Anson Street, Earle Street, Derry Street and Sutherland Street.

Electric Stunning Apparatus.—The Markets Committee has asked the surveyor to report on the provision of an electric stunning apparatus at the public slaughterhouses.

Bedford.—Electricity for Sutton.—The Electricity Committee is to extend its electricity supply to Sutton at a cost of £1,133.

Special Tariffs.—The introduction of special tariffs for electricity used for special purposes, such as greenhouse heating and industrial baking, is being considered.

Blackpool.—Special Industrial Tariff.—The Electricity Committee proposes to introduce a special tariff for light industries using a minimum of 100,000 kWh per annum. It will comprise a charge of £4 10s. per kW, plus 0.65d. per kWh, with discounts.

Bognor Regis.—Extensions.—The l.p. overhead line to Shripney has now been completed, while the underground h.p. extension has also been commenced to serve the parish of Climping and also "Bailiffscourt," the new residence of Lord Moyne.

Bradford.—Loans.—The Electricity Committee is to apply for sanction to the borrowing of £20,000 for transformers and sub-station switchgear.

Brighton.—Power Station Explosion.—An explosion took place in the pulverised fuel house at the Corporation's Southwick power station last Saturday, twenty workmen being injured. About 1 p.m. work was proceeding in and near the fuel house, when suddenly there was a roar and a flash and the roof was blown off, the workmen being flung in all directions. A fire commenced to spread, but the fire brigade speedily got it under control. Following an investigation, Mr. W. N. C. Clinch, the borough electrical engineer, informs us that he is in a difficulty definitely to indicate the origin of the trouble. What actually occurred was that the powdered fuel bunker of one of the units opened out at a seam due to an internal explosion, thus resulting in the liberation of considerable quantities of powdered fuel which were, in quantity, of such relationship to the air volume in the pulveriser house as to result in ignition from such flames as were present in the fuel bunker. The effect was short-lived, but it created sufficient pressure in the pulveriser house to cause all the roof glazing to be removed and the passage of heated fumes to pass through these apertures at a fairly high velocity, thus throwing over several men who were at work on the roof. Fortunately they did not fall from the roof of the boiler house, and were, therefore, only subjected to the injury from burns. The operation of the station as a whole was not affected, and the remaining pulveriser plant was put into operation within three hours.

Burnley.—Correction.—In our last week's issue we mentioned a new two-rate tariff for lighting. The concession by which the consumer obtains electricity for lighting at 2d. per kWh operates from 8 p.m. to *sunset* (not sunrise) the following day, leaving the full charge to be paid at 4½d. per kWh from sunset to 8 p.m.

Burton-on-Trent.—Extensions.—The Electricity Committee is to extend mains to Barton-under-Needwood at an estimated cost of £490.

Canada.—Electricity Supply in 1931.—The output from generating stations in Canada in 1931 was 16,331 million kWh, a reduction of 1,763 million kWh as compared with 1930. Exported power decreased at a greater rate—from 1,612 million to 1,235 million kWh. Over 98 per cent. of the output came from 307 water-power stations, and less than 2 per cent. from 252 steam and i.c. engine stations. The maximum available water power is estimated at 43,700,000 h.p. Pole-line mileage increased by 3,585 miles (546 transmission and 3,039 distribution) to 52,399 miles (20,225 transmission and 32,174 distribution). The number of consumers rose during the year by 25,000 to 1,633,000; new connections were all for lighting and the number of power consumers was reduced by nearly 500. The average revenue per kWh for domestic and farm uses worked out at 1.12d. per kWh, and for commercial lighting 1.35d. There were 12.89 domestic consumers per 100 of population, the proportion reaching 18.02 in British Columbia; the greatest rate of increase in this class was 108 per cent. in New Brunswick. The number of employés was 17,000. Capital expenditure (at par) was about £253,000,000, and gross revenue £25,000,000.

Cardiff.—Mains Extensions.—The Electricity Committee is to extend mains to the Ely housing estate, &c., at a cost of £1,000.

Carlisle.—Rural Development.—The Electricity Committee has under consideration the question of electrical development in rural areas, and has referred the matter to a sub-committee for report.

Mains Extensions.—Mains extensions costing £733 are to be carried out.

Catherington.—A Supply Inaugurated.—A supply of electricity has now been provided for the Garden Suburb, an extension having been made from Horndean by the Portsmouth Corporation. The work has cost £5,000, and the whole of 115 bungalows on the estate will be supplied.

Chesterfield.—New Sub-stations.—The Electricity Commissioners have agreed to the Electricity Committee's proposal to erect a rectifier sub-station in the Holywell Street area at once and four sub-stations later; sanction to a loan of £7,620 for the scheme is to be applied for. The Staveley Coal & Iron Co., Ltd., is to erect a sub-station at Tapton Park.

Combe Martin.—An Inquiry Asked For.—By 110 to 107 votes a parish meeting defeated a proposition that an overhead system of electricity supply, as recommended by the Ilfracombe Light & Power Co., Ltd., be approved, and an amendment was passed in favour of a public inquiry being held.

Dundee.—The Carolina Port Station.—The arrangement between the Electricity Committee and the Central Electricity Board for the transference to the latter of the generating station at Carolina Port was unanimously confirmed by the Town Council last week. It was also agreed that a special committee should hold a "watching brief" over the interests of the city in the matter.

The Chapeltown (Leeds) control room of the Central Electricity Board

Lighting Conversion.—At East House on March 8th the lighting system was changed over from gas to electricity.

Dumfries.—Cooker Charge Proposals.—The introduction of special tariffs for cooking is being considered.

Eastbourne.—Extensions.—The Electricity Committee is to provide supplies to Sayerlands, Polegate, at a cost of £1,198, and to the Beachy Head Hotel (£1,170), provided that the proprietor agrees to pay £1,000 towards the cost.

East Ham.—Relief of Rates.—It is proposed that £4,750 of the surplus of the electricity undertaking should be applied to the relief of the rates.

Enfield.—Installations for Council Houses.—The Housing Committee has expressed its willingness to tenants of the Council's houses on the Albany and Ponder's End Estates, who are not in arrears with their rent, to arrange for the installation of electricity for lighting purposes, provided that the tenants pay the cost.

Hastings.—Mains Extensions.—The following extensions of mains are to be undertaken by the Electricity Committee:—To Hollington (£195); between the Albion Hotel and Fishmarket (£400); and to supply houses in Priory Avenue (£144) and Beckley Corner Lane, Four Oaks (£126).

Holme Cultram (Cumberland).—Electricity Next Winter.—The Mid-Cumberland Electricity Co.'s supply of electricity will be available next winter, the route of the transmission line being from Aspatria to Abbey Town and then to Silloth.

Isle of Man.—ELECTRICITY CHARGES.—The Electricity Board has adopted the following tariffs:—Two-part for lighting, heating, and cooking in houses, combined shop residences, residential business premises, hotels, hospitals, schools, etc.: A fixed annual charge based upon floor area, plus a "unit" charge of 1d. Lighting flat rate, 7½d. per kWh. Flat rate for heating, cooking and other domestic uses, except motive power, 2d., with a minimum charge of 10s. for each winter quarter, and 5s. for each summer quarter. Lighting, maximum demand, for shops, offices, hotels, etc., 9d. per kWh up to the equivalent of 120 hours' use of the maximum demand, and 2d. beyond, with minimum quarterly charges as in the flat rate.

Langport.—OVERHEAD LINE INQUIRY.—The Rural District Council having objected to the erection of overhead lines in the rural area by the North Somerset Electric Supply Co., Ltd., a Ministry of Transport inquiry was to be held by Mr. F. Gordon Tucker yesterday.

Lochmaben.—STREET LIGHTING.—The Town Council has decided to adopt electricity for street lighting. The work will be carried out by Callender's Cable & Construction Co., Ltd.

London.—FULHAM.—The Electricity Committee is to extend mains in several streets at a cost of £920, and provide a h.p. sub-station at the premises of Messrs. Loud & Western, Ltd., Broughton Road (£1,208).

Sanction has been obtained to a loan of £10,000 for meters.

Malvern.—TRANSFORMERS.—The Urban District Council has applied for sanction to a loan of £2,000 for transformers.

Margate.—ELECTRICITY CHARGES.—The Isle of Thanet Electric Supply Co., Ltd., has reduced the minimum charge from 8d. to 7d. per kWh.

Oxford.—STREET LIGHTING CHARGES.—The Electricity Committee has decided to make a reduction of 20 per cent. in the charge for electricity for street lighting. All large lamps are to be left burning throughout the night without any additional cost, and lamps are to be duplicated at dangerous corners.

Plymouth.—FURTHER CONCESSIONS.—The Electricity Committee recommends the following amendments to existing schemes:—Free and assisted wiring: (*a*) that plug points be included for irons and radio sets; (*b*) that three lighting points and one plug point be taken as equivalent to the minimum of four points provided for under the original scheme; (*c*) that in houses divided into a number of flats fed from one service three lights or two lights and one plug per flat be accepted at the discretion of the engineer. The cost of wiring for cookers is to be extended, if required, to repayment in four quarterly instalments, and water heaters are to be included in the scheme of hire-purchase. A hire-purchase scheme for motors is to be substituted for the existing hire system.

St. Helens.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £15,000 for services, for which £20,000 was applied for.

RELIEF OF RATES.—Arrangements have been made for the contribution of £6,000 to the rates from the surplus of the electricity undertaking.

Shipley.—SCHEMES IN HAND.—The Electricity Committee is to undertake the following works during the ensuing twelve months: Change-over from d.c. to a.c. and recabling (£3,718), and interlinking l.p. network by means of mains extensions on Bradford and Bingley Roads (£657).

South Africa.—ELECTRICAL PROGRESS AT CAPETOWN.—The annual report of the Capetown electrical engineer, Mr. G. Swingler, shows that during 1931-32 over 78,000,000 kWh of electricity was sold, an increase of 20 per cent. over the previous year. Sales of electrical appliances under the hire-purchase scheme comprised 1,520 ranges, 248 refrigerators, 69 water-heaters, 26 washing machines, and 193 kettles, irons, percolators, etc. Further satisfactory progress was made in the reconstruction, standardisation, and extension of the transmission and distribution systems.

Spalding.—OFFERS TO PURCHASE UNDERTAKING.—The Urban District Council has considered in committee two offers to purchase the electricity undertaking, and has decided that they are not sufficiently attractive.

Stoke-on-Trent.—PROPOSED REVISION OF CHARGES.—The Electricity Committee has further considered the general question of charges but has deferred further consideration until the result of the past year's working is known. In the meantime the engineer has been instructed to prepare alternative tariffs for consideration.

EXTENSIONS.—Supplies of electricity are to be provided to the tileries of Messrs G. H. Downing, Ltd., Tunstall, at a cost of £500, and to the Corporation sewage pumping station at Hanford (£780). Mains and sub-stations in connection with supplies to Tarring, Salvington, Ferring, Rustington and Findon, &c., will cost £14,297.

DOMESTIC EQUIPMENT FOR INSTITUTION.—The Health Committee is to provide electric cooking apparatus (£200) and a refrigerator (£180) at the Mental Institution.

Torquay.—RURAL ELECTRIFICATION.—At a recent meeting of the Electricity Committee a letter was read from the Electricity Commissioners in which it was stated that the Development Commissioners would be prepared in suitable cases to entertain applications for assistance under the Development and Road Improvements Funds Act, 1909, on the lines of that granted to Bedford Corporation in respect of its electrical development of rural areas, and that in the event of Torquay Corporation being able to put forward particulars of a suitable area, the Commissioners would be prepared to consider granting assistance to that area. It appears that the possibilities of the Corporation being in a position to avail itself of such an offer are rather remote, but the matter is to be further investigated.

United States.—THE ST. LAWRENCE WATERWAY SCHEME.—The St. Lawrence Waterway Scheme has been approved by the United States Senate Foreign Relations Committee.

Warrington.—SUPPLY TO DUNHAM MASSEY AREA.—The Electricity Committee has authorised the electrical engineer to interview the Electricity Commissioners with regard to the supply of electricity to the Dunham Massey area.

RELIEF OF RATES.—A sum of £4,500 has been voted from the profits of the electricity undertaking for the year ending March 31st for the relief of rates.

Whitehaven.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £1,800 for overhead and underground mains and sub-station equipment, and £1,600 for a sub-station and meters, and the cost of changing consumers' apparatus.

Wolverhampton.—MAINS EXTENSIONS.—The Electricity Committee is to lay distributing mains at a cost of £5,624.

Traction

Bradford.—BUSES TO REPLACE TRAMS.—At a recent meeting of the Tramways Committee the manager reported upon the unsatisfactory condition of the permanent way from Tong Cemetery to Drighlington, and the Committee decided to recommend that a service of buses should be substituted for the trams on that route.

Dagenham.—TRAFFIC SIGNALS.—Automatic traffic signals costing £532 are to be installed.

Derby.—TRAMWAY ABANDONMENT.—The Corporation has applied to the Minister of Transport for an Order authorising the abandonment of the trams on two routes.

France.—RAILWAY ELECTRIFICATION.—The Midi Railway has made arrangements for the electrification of the Bordeaux-Montauban and Narbonne-Port Bou lines, a total length of 190 miles, to be commenced on the completion of the Montauban-Sete and Bordeaux-Point de Grave sections, the electrification of which is now in hand. A total of 925 miles, or 35 per cent., of the Midi system is now electrified, and when the present programme is completed at the beginning of 1937, the percentage will have risen to 52.

Germany.—MORE DIESEL-ELECTRIC RAILCARS ORDERED.—In addition to the Diesel-electric railcars mentioned in our issue of February 24th, the German State Railways have just ordered a further ten 150-h.p. Diesel-electric cars, with a maximum speed of 50 m.p.h. and a weight of 20 tons, for use on branch lines.

Italy.—RAILWAY ELECTRIFICATION.—According to the *Railway Gazette*, one of the large secondary railway systems belonging to the Soc. Emiliana di Ferrovia, Tramvie e Automobili, has now been converted from steam to electricity. The system has a total length of 126 km., various lines radiating from Modena. New extensions will also shortly be opened from Mirandola to Rolo, and from Maranello to Frignano (48 km.).

Leeds.—TRAFFIC CONTROL.—The Watch Committee recommends the provision of traffic signals at ten road junctions.

Leyton.—TRAFFIC SIGNALS.—The Highways Committee is to install further automatic traffic signals costing £846.

London.—PICCADILLY RAILWAY EXTENSION.—The fine weather encouraged thousands of local residents to use the free tickets issued by the Underground Railway last Monday on the occasion of the opening of the 2¾-mile extension of the Piccadilly Railway from Arnos Grove to Southgate and Enfield West. The extension will be completed to its ultimate terminus at Cockfosters in the summer. Southgate and Enfield West station buildings are similar in design to the other new stations described in our issue of September 23rd last. A new sub-station has been built at Southgate, and another is being erected at Cockfosters. Both are equipped with mercury-arc rectifiers, and are arranged for remote control from Wood Green sub-station. Through trains to the Piccadilly line will run every ten minutes, and the journey from Enfield West to Piccadilly will take thirty-one minutes. The Piccadilly Railway as a whole now has a speed of 25 m.p.h., including station stops, and is claimed to be the fastest underground railway in the world.

Middlesbrough.—THE PROPOSED TRANSPORT MERGER.—The local branch of the E.T.U. has protested to the Town Council against the proposal to merge the Corporation transport undertaking with that of the United Automobile Services, Ltd., on the grounds that the control of the undertaking will pass into the hands of private enterprise.

Russia.—Underground Railway for Moscow.—The *Bulletin* of the Russo-British Chamber of Commerce states the foundations and tunnels of the Moscow tube railway are now under construction. Work has commenced in several new districts, and in 1933 some 2.5 km. of tunnels will be built. The eight underground stations will be nearly completed this year.

Switzerland. Railway Electrification.—Work is now well in hand on the electrification of the Delemont-Delle section of the Swiss Federal Railways, contracts having just been placed for the erection of the necessary overhead contact lines.

United States.—Trolley-bus Contact-line Maintenance.—To facilitate the erection of overhead contact lines for several new trolley-bus services and also to allow the lines, when completed, to be readily inspected and kept in order, the Wisconsin Gas & Electric Co. has recently put in service the special vehicle built by the Four Wheel Drive Auto Co., Clintonville, Wis., which is illustrated herewith. The chassis of the vehicle is a standard 3½-ton truck equipped with a 90-hp. engine and five-speed gear box, with transmission to all four road wheels. The driver's seat is entirely enclosed, and behind

The 3½-ton truck for trolley-bus overhead-line maintenance

the cab, on the sides of the truck platform, large lockers are provided for the accommodation of tools and material for overhead work. The upper stage of the hydraulic column is so arranged that it and the platform can be swivelled round a full circle. In its lowered position the floor of the platform is 11 ft. 6 in. above the ground, and when fully extended 17 ft.; the time occupied in raising the platform is stated to be only 40 seconds.

Wolverhampton.—Trolley-bus Extensions.—The Transport Committee is to extend the Wednesfield trolley-bus route at an estimated cost of £400.

Communications

China.—Radio Services.—The Ministry of Communications has been negotiating for the cancellation of the Mackay Co.'s radio contracts. According to the *Chinese Economic Bulletin*, the Ministry and the Marconi Co. have arranged to obtain loans from the British Boxer Indemnity refund for the purchase of the necessary materials and apparatus required for a proposed Sino-British project, which is expected to provide direct communication with England in about six months' time.

The Eurasia Aviation Corporation has arranged with the Sinkiang Provincial Government for the establishment of radio stations at Tihua and Hami, on the north-western airway.

Long-distance Telephony.—A service has been established at Honan which interlinks seventy-eight districts in that province. Two lines in eastern Hupeh, linking Wuchang with Yingshan (across the Anhwei border) and Hankow with Tean, have been opened for traffic. The combined length of the two lines exceeds 200 miles, and only 25 per cent. of the estimated expenditure was found necessary for their completion.

Great Britain.—Telephone Statistics.—At the end of 1932 Post Office exchange stations numbered 2,077,019, the Hull Corporation system had 17,771, the States of Guernsey 4,675, the States of Jersey 4,033, while there were 15,427 railway and other telephones with exchange connections, making a total of 2,118,925, an increase of 66,293. The G.P.O. also owns and maintains 27,484 private lines.

Radio Relay Exchanges.—The West Sussex County Council has given consent to the Bognor Regis Rediffusion Service, Ltd., to place not more than two pairs of wires over any specified county road in the parish of Bersted in connection with a wireless relay service.

The Watford Town Council has informed applicants for permission to establish a relay service for the borough that consideration is at present being given only to local applications.

The Halesowen Urban Council has granted an application to establish a relay service by Broadcast Listeners' Service, Ltd., for a period of ten years.

The Lanarkshire County Council has granted permission to Wireless Services, Ltd., London, to erect wires over highways in connection with a relay service for Bellshill.

The Kidderminster Town Council has refused an application by Broadcast Listeners' Service, Ltd., for permission to operate a service in the borough.

The Dorchester Corporation has prepared an agreement with the National Broadcast Relay Co.

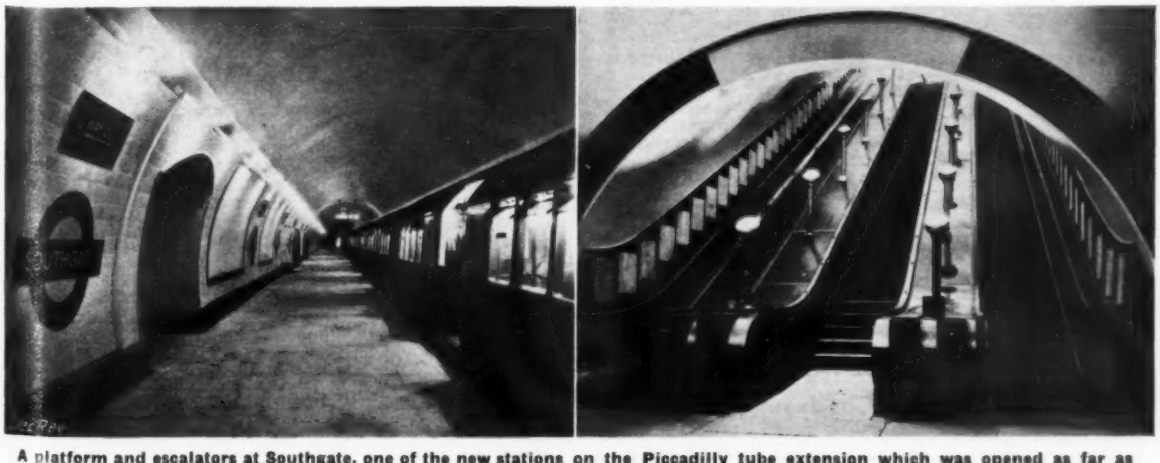
The Hornchurch Urban Council has decided to allow the National Broadcast Relay Co. to establish a service.

Panama.—Telephone Service.—A telephone service between the United States and the Republic of Panama, and between the United States and the Panama Canal zone, has just been inaugurated. The link between the telephone systems of America and Canada is a radio-telephone circuit from the American Telephone and Telegraph Co.'s new short-wave station at Miami, Florida, to the Tropical Radio-Telegraph Co.'s station near Panama City. This is the fourth service to open through the Miami station, an extension having recently been made to the Bahamas, Columbia, and Venezuela.—*Reuter's Trade Service* (New York).

Scotland.—Power-line Telephony.—At the Grampian hydro-electric works telephone communication is maintained over the 132-kV power circuits. The speech frequency from an ordinary telephone is amplified and connected to the grid of a transmitting valve which controls a wireless transmission circuit, and in this way the voice frequency is superimposed upon a wireless frequency. The carrier wave is modulated by the voice and the high-frequency current is passed through a pair of condensers to the 132-kV overhead line, where it is tapped off through condensers into a receiving set at the other end, in which demodulation takes place. The high-frequency current has a periodicity of over a thousand times that of the 50-cycle power circuit, and, therefore, there is no difficulty in separating the transmission from the carrier current. The frequency of transmission is approximately 130,500 cycles per sec., while that of the calling wave is about 81,000 cycles per sec.

Siam.—Photo-telegraphy.—A picture telegraph service has lately been inaugurated between Berlin, Germany, and Bangkok, Siam.

United States.—Telephone Decline.—During 1932 the A. T. & T. Co.'s telephones declined by 1,596,765 to a total of 13,793,229. The Bell and associated companies showed a similar decline by 2,100,000 to a total of 17,500,000.



A platform and escalators at Southgate, one of the new stations on the Piccadilly tube extension which was opened as far as Enfield West last Monday

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—Melbourne.—May 2nd. Post and Telegraph Department. Loading coil pots. (A.X. 11716.)*

Brisbane.—May 15th. City Electric Light Co., Ltd. Coal conveyor. Company's offices, Boundary Street, Brisbane (specifications £2 2s.).

June 22nd. 45- and 11-kV switchgear. Company's offices (specifications £2 2s.).

July 20th. Supervisory control equipment. Company's offices (specifications £2 2s.).

Sydney.—March 31st (extended from February 13th). Electricity Department. Twenty-six double secondary current transformers. Stores superintendent, Electricity Department, Town Hall.

Ayr.—March 24th. County Council. Various works, including electrical, at housing scheme. Mr. W. Reid, county architect, Ayr.

Bo'ness.—March 20th. Town Council. Various works, including electric lighting, for housing scheme. Mr. Wm. Beattie, director of housing.

Carlisle.—April 5th. Electricity Department. Cables. (See this issue.)

China.—Chinese Government Purchasing Commission. Insulated cables. (March 10th.)

Ealing.—March 24th. Electricity Department. Switchgear, voltage regulators and transformers. (March 10th.)

Edinburgh.—March 20th. Corporation. Electric lighting and power installation at the east wing of the City Chambers. Engineer's Office, Dewar Place (deposit £1 1s.).

Exminster.—March 24th. Committee of the Devon Mental Hospital. Six months' supply of lamps, &c. Mr. C. Masters, clerk, Hospital.

Frimley & Camberley.—March 18th. Urban District Council. Vehicle actuated traffic control signals. (March 10th.)

Galloway.—March 28th. Galloway Water Power Co. Construction of Glenlee pipe-line. Sir Alex. Gibb and Partners, Queen Anne's Lodge, Westminster, S.W.1 (fee £10 10s.).

Glasgow.—March 23rd. Corporation. Electrical work at High School extension. Education Offices (Property Department), 129, Bath Street.

Great Western Railway.—April 6th. Electric wires and cables, telegraph ironwork and lamps. (March 10th.)

Halifax.—March 20th. Health Committee. Boiler-house plant for Isolation Hospital. (March 10th.)

Hull.—March 21st. Electricity Department. (*a*) Static transformers, lamp posts, and brackets; and (*b*) time switches. (March 3rd.)

India.—New Delhi.—March 27th. Indian Stores Department. Sac negative elements for Leclanché cells. (A.X. 11719.)*

Kirkoudbright.—March 25th. County Council. Electrical installation work in connection with assisted wiring scheme. Messrs. Buchan & Partners, 16, Young Street, Edinburgh (deposit £1 1s.).

Lithuania.—Kovno.—March 29th. Administration of Posts, Telegraphs and Telephones. Telephone cable, wire, telephone sets and instruments. (A.X. 11715.)*

Maghull (near Liverpool).—March 21st. Office of Works. Electric lighting installation. (March 10th.)

Manchester.—March 24th. Electricity Committee. Static transformers. (March 10th.)

March 21st. Lamps. (March 10th.)

Montrose.—Town Council. Various works, including electric lighting, at concert pavilion. Mr. G. Fairweather, architect, Montrose.

Northern Ireland.—April 3rd. Electricity Board. L.p. distribution systems. (March 3rd.)

South Africa.—Capetown.—March 29th. Electricity Department. Overhead line equipment, including street-lighting fittings (G.X. 12336)*; 1,000 tubular steel poles and fittings (G.X. 12339)*; and ironclad service cut-outs (A.X. 11710).*

April 5th. Overhead line material. (A.X. 11730.)*

Johannesburg.—April 20th. City Council. Weatherproof braided copper conductors (A.X. 11724)* and a 1,000-kW a.c. to d.c. convertor plant (A.X. 11725)*.

Durban.—April 21st. City Council. Lead-covered paper-insulated telephone cable (A.X. 11726)*, cable distribution boxes and sundries (A.X. 11727)*, and lead-covered indoor telephone cable (A.X. 11728)*.

Stoke-on-Trent.—April 5th. Electricity Department. Static transformers and e.h.p. truck-type switchgear. (See this issue.)

Tynemouth.—April 3rd. Electricity Department. Voltage regulator and 200-kW mercury rectifier. (March 10th.)

Warrington.—March 20th. Electricity Department. E.h.p. sub-station switchgear and hot water circulator. (March 10th.)

April 3rd. Transformers. (See this issue.)

Wheatley Carr (near Burnley).—Trustees of Inghamite Church. Installation of electricity at church and Sunday school.

Whitby.—March 21st. Electricity Department. Electrical materials. (March 10th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Ammanford.—Urban District Council. Work in connection with the change-over scheme. Laying underground mains (£1,113).—Pirelli-General Cable Works, Ltd. Switchgear (£511).—New Switchgear Construction Co., Ltd. Transformers (£262).—General Electric Co., Ltd.

Barrow-in-Furness.—Town Council. Accepted. Busbars (£60).—Enfield Rolling Mills, Ltd. Transformers (£197).—Yorkshire Transformer Co., Ltd. D.c. switchboard (£445).—Metropolitan-Vickers Electrical Co., Ltd.

Bedford.—Electricity Committee. Recommended. Assisted wiring.—P. C. Kidman & Son; R. Carter. Cable.—Macintosh Cable Co., Ltd.

Belfast.—City Council. Accepted. Electrical pumping plant (£1,155).—Robert Craig & Sons (Engineers), Ltd.

At the City Council meeting it was stated that the lowest tender received (£986) was from a Glasgow firm, and an amendment was put forward that the matter be referred back because it was "subsidising a local firm." The Council was allowed to give 5 per cent. preference locally, but in this case a 15 per cent. preference was given. It was contended that a pump made locally would receive closer supervision. The amendment was defeated.

Blackpool.—Electricity Committee. Accepted. Switchgear for transformer houses.—General Electric Co., Ltd.; English Electric Co., Ltd.

Bletchingley.—Surrey County Council. Accepted. Electric lighting installation at Botley Park Hospital (£1,050).—Chapman, Lowry & Puttick, Ltd. Internal telephones (£134).—E. Shipton & Co., Ltd.

Cardiff.—Hospitals Committee. Accepted. Staff signalling system at hospital (£290).—Page & Stibbs. Electrical fittings at hospital (£1,033).—Best & Lloyd, Ltd.

Electricity Committee. Accepted. Control panels (£943).—Metropolitan-Vickers Electrical Co., Ltd.

Chesterfield.—Electricity Committee. Accepted. Switchgear (£173).—Switchgear & Cowans, Ltd.

Guildford.—Town Council. Accepted. Wiring 156 houses for electric lighting (£830).—Hall & Stinson, Ltd.

Hastings.—Electricity Committee. Recommended. Two 200-kVA three-phase transformers for Brede pumping station (£281).—Ferranti, Ltd. V.i.r. cables for house wiring and straight-through boxes.—W. T. Henley's Telegraph Works Co., Ltd. Cables, underground and pole mounting boxes for 22,000 and 11,000-V, l.p. boxes for pilot cables and l.p. pole mounting boxes, joint box compound, sealing compound and compound buckets.—W. T. Glover & Co., Ltd. L.p. service boxes, straight-through boxes and lead strip.—British Insulated Cables, Ltd. Cut-outs.—Siemens Bros. & Co., Ltd. Meters.—Metropolitan-Vickers Electrical Manufacturing Co., Ltd. Meter boards, switch base blocks, &c.—Wootton & Co., Ltd.

Baths Committee. Accepted. Installation of electricity at the bathing pool (£886).—R. H. Pattenden.

London.—L.C.C.—Mental Hospitals Committee. Accepted. Electric lighting, fire alarm and telephone installations at Leavesden mental hospital annexe (£1,738).—Buchanan and Curwen, Ltd.

Main Drainage Committee. Accepted. Alterations to electrical wiring and fittings at the Southern outfall works (£1,510).—Hall & Stinson, Ltd.

Torquay.—Electricity Committee. Accepted. Overhead line to Moretonhampstead (£5,594).—Pirelli-General Cable Works, Ltd.

Warrington.—Highways Committee. Accepted. Two 40-cell electric vehicle batteries.—Chloride Electrical Storage Co., Ltd.

Housing Committee. Accepted. Wiring ninety houses on the Princess Avenue Estate.—H. Lilley.

Wolverhampton.—Electricity Committee. Accepted. Switchboard and kiosk (£185).—Crompton Parkinson, Ltd.

Workington.—Electricity Committee. Recommended. Transformer.—English Electric Co., Ltd.

Fatality

In the Westminster Coroner's Court on March 7th, Mr. Ingleby Oddie held an inquiry into the death of Leonard Charles Smith, an electrician, who received a fatal electric shock recently at the Grosvenor House Hotel, Park-lane, W. George Archer said that on Thursday evening he was working with Smith, who was connecting up some wires in connection with new ovens in the kitchen, at the back of a switchboard in the basement. There was a space of about a foot between the panel and the wall. Smith was not wearing rubber gloves, which were provided. He must have touched a live part of the board with his spanner or body.

John W. Heard, chief engineer's assistant at the hotel, said that Smith had no instructions to connect to the switchboard. It should have been left to the night staff to complete, as it was more convenient to do the work then and the board could be made "dead" and safe. Mr. Richard Morgan, the chief engineer, agreed with Mr. F. Murgatroyd, A.M.I.E.E., H.M. Inspector of Factories, that if the hotel had come under the Factory Act the switchboard, being only 11 in. from the wall, would not have been in accordance with the regulations, which laid it down that there should be a space of 3 ft. in order that a man could go behind to work. A verdict of "Accidental death" was recorded.

Forthcoming Events

British Electrical Development Association.—Friday, March 17th. Savoy Hotel, W.C. 12.45 for 1 p.m. Annual luncheon, 3 p.m. Annual meeting, Friday, March 24th. Caxton Hall, Westminster, S.W. 7 p.m. National Finals in the E.D.A. Public Speaking Competition.

Batti-Wallahs' Society.—Friday, March 17th. Hotel Metropole, W.C. Annual dinner and dance.

Junior Institution of Engineers.—Friday, March 17th. Institution, London. 7.30 p.m. "Developments of Internally Fired Boiler Plants." G. E. Lofts.

Finsbury Technical College Old Students' Association.—Saturday, March 18th. Trocadero Restaurant, W.C. Annual dinner.

Association of Mining Electrical Engineers.—Saturday, March 18th. Technical Institute, Newport. 6 p.m. "Some Comparative Notes on Pumping." Mr. S. B. Haslam.

Association of Supervising Electrical Engineers.—Tuesday, March 21st. Junior Institution of Engineers, London. 7.15 p.m. "Electricity in the Theatre and Cinema." Mr. J. Hall.

Paisley Association of Electrical Engineers.—Tuesday, March 21st. Y.M.C.A., Paisley. 7.30 p.m. "Heating and Cooking."

Institution of Electrical Engineers.—Thursday, March 23rd. Institution, London. 6 p.m. "The Present Practical Limits of Power Station Efficiency." Mr. W. S. Burge. (*Meter and Instrument Section*).—Friday, March 17th. Institution, London. 7 p.m. Informal discussion. (*Sheffield Students' Section*).—Friday, March 17th. University, Sheffield. 8 p.m. "The Future for Electrical Engineers." Prof. E. W. Marchant. (*South Midland Centre*).—Monday, March 20th. University, Birmingham. 7 p.m. "The Electrification of the Manchester, South Junction, and Altrincham Railway." Lt.-Col. F. A. Cortez Leigh. (*Western Centre*).—Monday, March 20th. Merchant Venturers' Technical College, Bristol. 6 p.m. "Electric Lighting of Buildings." Mr. A. B. Read and Dr. J. W. T. Walsh. (*North Midland Centre*).—Tuesday, March 21st. Hotel Metropole, Leeds. 7 p.m. Annual general meeting. (*East Midland Sub-Centre*).—Tuesday, March 21st. College of Technology, Leicester. "Sound Film Reproduction." Mr. T. Wadsworth. (*North-Western Students' Section*).—Tuesday, March 21st. Engineers' Club, Manchester. 7.15 p.m. Short papers. (*London Students' Section*).—Wednesday, March 22nd. Imperial Hotel, Russell Square, W.C. 7.15 for 7.30 p.m. Annual dinner. (*North-Eastern Students' Section*).—Wednesday, March 22nd. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Joint meeting with the N.E.C. Institution graduates. "Diesel-Electric Locomotives." Mr. S. G. Irving.

Birmingham Electric Club.—Friday, March 24th. Grand Hotel, Birmingham. 7 p.m. "Modern Electrical Problems dealt with Experimentally." Mr. J. F. Driver.

Notes

E.D.A. Annual Luncheon

The Minister of Transport, the Hon. Oliver Stanley, will be the chief guest at the annual luncheon of the British Electrical Development Association which is to be held at the Savoy Hotel at 1 o'clock to-day Friday. Mr. Stanley will also propose the principal toast.

Two I.E.E. Dinners

Sir Felix Pole was the chief guest at the annual dinner of the West Wales (Swansea) Sub-Centre of the Institution of Electrical Engineers on March 10th, at which Mr. J. W. Burr (chairman) presided. Sir Cyril Kirkpatrick, consulting civil engineer for the new Swansea power station, in proposing "The Institution of Electrical Engineers," said that the freezing process of tunnelling employed at the new station held out for certain schemes possibilities not open to them before. Mr. H. T. Young, responding, suggested that some of the savings of the country might be used for rural electrification. "The Electrical Industry" was given by Sir Alfred Cope, who said that the coal industry regarded electricity as one of its deadliest enemies, but he thought that this was entirely wrong. Sir Felix Pole, in reply, said the completion of the grid, with its 4,000 miles of transmission lines, could only be regarded as the first stage in that electrical age which they all believed was about to commence. There was much to be said for main-line electrification, particularly if it was associated with the provision of secondary transmission lines in order to hasten the electrification of agricultural work.

Other speakers were: Mr. F. H. Corson, the Mayor of Swansea (Coun. Daniel Evans), Dr. C. A. Edwards, principal Swansea University College, Councillor T. W. Mainwaring Hughes, president, Swansea Chamber of Commerce, Mr. Lewis Jones, M.P., Sir A. Whitten Brown, and Alderman Sir Percy Molyneux.

The annual dinner of the North Midland Centre took place on March 10th, at Leeds, under the chairmanship of Mr. R. M. Longman. Responding to the toast of the Institution, Prof. E. W. Marchant, President, strongly advocated the speeding up of electrification of suburban railway lines and of textile factories. As well as being desirable for its own sake, there was never a time more particularly suitable for such development. The chairman (Mr. R. M. Longman) suggested that with its scientifically trained members the Institution was in a position to respond to the Prime Minister's invitation to put forward ideas for profitable and productive schemes.

The Lord Mayor of Bradford (Alderman J. W. Longley, himself an electrical engineer), responding to a toast to "The Guests"—proposed by Mr. S. E. Fedden, manager of the Central Electricity Board for Mid-East England—said the outlook for the electrical industry was more favourable than for any other, and there were many more opportunities to come. It was only a question of capital cost before all existing steam plants in factories and iron and steel works were replaced by electricity. To textile people the cost of power was a small item in proportion to other costs, and they might not look at any scheme merely for the sake of reduced power cost, but if they could be shown that production could be increased by 2½ per cent. they were prepared to spend a good deal to get that. Alderman E. J. Clarke, Deputy Lord Mayor of Leeds, also responded to the toast.

The I.M.E.A. Convention

The headquarters of the I.M.E.A. Convention at Bournemouth will be the Royal Bath Hotel, and the convention office will be at the West Lounge, Pavilion. The first official function will be the reception by the president (Mr. Geoffrey Porter) supported by the Mayor of Worthing at the Pavilion Ball Room at 8.15 p.m. on Monday, June 12th. The opening of the convention itself will, as usual, take place at 10 a.m. on the following day, when after a civic welcome by the Mayor of Bournemouth at the Pavilion Concert Hall (where all the sessions will be held), Mr. Porter (borough electrical engineer, Worthing) will deliver his presidential address. This will be followed by a paper on "The Design, Equipment and Operation of Static Sub-stations," by Mr. E. Seddon (city electrical engineer, Edinburgh) and Mr. J. Eccles, his technical assistant.

In the afternoon an official visit will be paid to the exhibition at the Winter Gardens and in the evening (at 8.15) there will be a reception by the Mayor and Mayoress of Bournemouth at the Town Hall. On Wednesday morning "Tariffs and Metering" will be the subject of a paper by Mr. W. Lawson (Birmingham undertaking) and in the afternoon a coach trip will probably be arranged.

Two papers will be read on Thursday. One in the morning on "Electric Cooking—Domestic and Commercial," by Messrs. P. J. Robinson (city electrical engineer, Liverpool) and E. E. Hoadley (borough electrical engineer, Maidstone), and the other after lunch, by Dr. H. J. Denham, on the subject of electricity supply in rural areas.

The E.A.W. will give a luncheon at the Pavilion and will afterwards pay a visit to pottery works at Poole. The annual dinner will, as in previous years, take place on the Thursday evening; tickets 12s. 6d. exclusive of wine.

The only item so far arranged for Friday is the annual general meeting at 10.30 a.m., but on Saturday morning (June 17th) the C.E.B. sub-station is to be visited. The golf competition is once more being organised by Mr. R. N. Torpy (borough electrical engineer, Tunbridge Wells), and the Bournemouth Corporation is offering the free use of its many amenities to the delegates.

Plastic Moulding Trades Luncheon

The British Plastic Moulding Trade Association is holding its annual trade luncheon on Thursday next at the Savoy Hotel, when Prince George will be the guest of honour.

Generation of Electricity in February

The official returns rendered to the Electricity Commissioners show that 1,151 million kWh was generated by authorised undertakers in Great Britain during February (28 days) as compared with the revised figure of 1,133 million kWh in the corresponding month (29 days) of 1932, an increase of 18 million kWh or 1.6 per cent. During the first two months of 1933 the total amount of electricity generated by authorised undertakers was 2,487 million kWh as compared with the revised figure of 2,295 million kWh for the corresponding period of 1932, representing an increase of 192 million kWh or 8.4 per cent.

The E.A.W. Ball

The annual ball of the Electrical Association for Women will be held at the Dorchester Hotel on April 7th, and not this evening (Friday), as announced in our last issue, the date having been changed owing to the clashing of another important electrical function.

I.E.E. London Students

The annual dinner of the London Students' Section of the I.E.E. will be held on March 22nd at the Imperial Hotel, Russell Square. Tickets (5s. 6d.) may be obtained from Mr. T. S. Smith, 51, Exeter Road, Welling, Kent.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:

DIAMOND electric kettle.

MONARCH electric wash boiler.

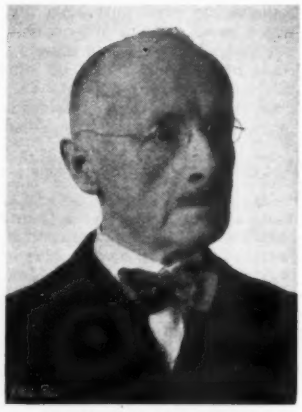
PETITE PATOUCHE insulating tape.

Manufacturers of works heating plant, utilising the direct heat from a furnace on to tubular or other heaters, through which air is drawn for distribution into the works.

BRITELITE automatic spot light.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements



Mr. H. Faraday Proctor

Mr. H. Faraday Proctor, M.I.E.E., has been elected an honorary member of the Incorporated Municipal Electrical Association. The honour is a well-deserved one for Mr. Proctor has been a member of the I.M.E.A. since its inception, and was a signatory to the Memorandum of Association. He was a member of the Council from 1896 to 1930, president in 1898-99, honorary secretary from 1906 to 1919, and honorary treasurer in 1919-30. He retired from the position of chief engineer and general manager of the Bristol Corporation in November last, after an association with that undertaking extending over a period of thirty years. An outline of his career was published in our issue of May 13th, p. 710.

Mr. Rene Plevin recently joined the board of the International Automatic Telephone Co., Ltd.

Mr. J. W. Rissik, who opened the discussion on "Will Oil Switches be Superseded?" at the informal meeting of the I.E.E. on Monday last

Mr. James F. Fogarty was recently elected president of the North American Light & Power Co.

Mr. C. J. Monk was elected president of the South African Institute of Electrical Engineers at the annual meeting held in Johannesburg recently.

Mr. T. R. Whitehead, who, as reported in our issue of February 3rd (p. 175), is retiring from the position of transport manager to Coventry Corporation, has been recommended by the Salaries Committee for a superannuation pension of £395, plus a gratuity of £150 per annum for seven years. At a meeting of the Town Council an amendment was carried that the portion of the recommendation relating to the gratuity be referred back.

Mr. H. C. Godsmark, deputy general manager of the Nottingham Corporation Passenger Transport Department, has been appointed general manager of the Huddersfield Corporation Tramways and Transport Department, in succession to **Mr. A. A. Blackburn,** who is about to retire on superannuation. Mr. Blackburn's retirement was postponed some months ago

Mr. H. C. Godsmark

[Lafayette

Mr. B. England

owing to the illness of Ald. Canby, chairman of the Tramways Committee. Mr. Godsmark, who commences with a salary of £900 per year, rising to £1,100, is thirty-six years of age, and is an associate member of the Institute of Automobile Engineers and the Institute of Transport. He was for five years technical assistant under the London County Council, four years as chief technical assistant at Manchester, one year as assistant rolling-stock engineer at Nottingham, and for some time past has been deputy manager there.

Mr. B. England, general manager and engineer of the St. Helens Corporation Transport Department, has been appointed to a similar position by the Southend-on-Sea Corporation. Mr. England served his apprenticeship with the Consolidated Diesel Engine Manufacturers, Ltd., at that company's Ghent works. He enlisted in the Coldstream Guards in 1914, and was invalided out of the service in 1918, retiring with the rank of captain. From 1918 to 1921 he occupied various positions with the Yorkshire (West Riding) Electric Tramways Co., Ltd., and its subsidiary the West Riding Automobile Co., Ltd., and in 1921 he was appointed local manager at Castleford. He held this position until 1925, when he was appointed local manager at Wakefield for the same companies, and left Wakefield in 1925 to take up the appointment with St. Helens Corporation. Mr. England is an associate of the I.E.E.

[Elliott & Fry

Mr. H. R. Cantelo, joint author with Messrs. W. Ure and E. J. Grainger, of the paper on balancing radio amplifiers, read recently before the Wireless Section of the I.E.E.

Lord Ashfield has accepted the presidency of the British Electrical Development Association, Inc., in succession to Lord Meston. **Mr. H. C. Lamb,** M.I.E.E., city electrical engineer and manager, Manchester, vice-chairman of E.D.A.,

[Elliott & Fry

Lord Ashfield

[Lafayette

Mr. H. C. Lamb

is succeeding **Mr. C. H. Cox** as chairman, and **Mr. R. S. Downe,** M.I.E.E., manager and chief engineer of the Brompton & Kensington Electricity Supply Co., has been nominated as the new vice-chairman.

Dr. H. H. U. Cross, whose book on "Piles et Accumulateurs pour Auto, Radio, etc.," is reviewed in this issue, is well known to our readers, both on account of articles which we have published from his pen and by the many works on automobile ignition systems and accumulators which he has produced. His latest book has also been translated into Japanese, and he was recently in California, where he delivered lectures on electro-chemistry. Dr. Cross recently married Mlle. Marcelle Gegout, who was scientific secretary of the Jean Meyer Foundation, Paris.

Dr. H. H. U. Cross

Mr. G. A. Fulcher, chief clerk in the Southend-on-Sea Corporation Electricity Department, has retired after thirty-one years' service, and has been presented by his colleagues with an illuminated address and album.

Mr. J. H. Farthing, who has been appointed a director of the General Electric Co., Ltd., in place of the late **Mr. H. V. Wynne Roberts,** is the company's manager for the Lancashire and Yorkshire area. He joined the company in 1893 as an assistant in the Fittings Department, and five years later was transferred to the Manchester branch to take up the duties of manager of the Fittings and Heating Department. In January, 1908, he was appointed deputy manager of the Lancashire and Yorkshire area, and seven years later he was promoted to the position of manager, which he has occupied successfully for nearly eighteen years. Thus it comes about that almost exactly forty years after joining the company, and as doyen among the home branch managers, he takes a place on the board. Since 1917 he has been a director of Salford Electrical Instruments, Ltd., one of the associated companies of the G.E.C. Mr. Farthing is well known in many parts of the country, and he is frequently a speaker of acceptance at social functions connected with the industry.

Mr. J. H. Farthing

Mr. P. J. Pybus, who recently resigned the position of Minister of Transport, has been reappointed a director of the Phœnix Assurance Co.

Mr. T. W. Ellis, M.I.E.E., M.I.Mech.E., has been elected to the presidential chair of the Institution of Engineering Inspection for the ensuing year, in succession to **Lt.-Col. J. H. M. Greenly,** C.B.E., B.A., of Messrs. Babcock & Wilcox, Ltd.

Mr. W. S. Wilson, M.I.E.E., 4, St. Nicholas Buildings, Newcastle-on-Tyne, has been appointed by Messrs. L. Weekes (Luton), Ltd., as their representative in the Northumberland-Durham area.

Obituary

Mr. P. Priestley.—The death is reported, at the age of 57, of Mr. P. Priestley, general manager of the Liverpool Corporation Tramways, which occurred on March 13th in a Liverpool nursing home, following an operation for appendicitis. Mr. Priestley was apprenticed to Sir William Allan, Ltd., Sunderland, and, after five years' marine experience, went to Halifax in 1901 as assistant engineer in the Corporation electricity undertaking. Later in the same year he became borough electrical engineer, and held this position until 1907, when he took up the position of general manager and engineer to the Mexborough and Livinton Tramways Co. Mr. Priestley's next post was as general manager and engineer to the Oldham Corporation, which he held from 1916 to 1918, leaving there to take up a position at Liverpool under Mr. C. W. Mallins. He was appointed general manager at Liverpool in 1920. He was a member of the Institutions of Electrical and Automobile Engineers, and of the Institute of Transport, and in 1925 was president of the Municipal Tramways and Transport Association.

Herr M. Schiemann.—The death is reported from Wurzen, Saxony, at the age of 67 years, of Herr Max Schiemann, one of the pioneers of the electric trolley-bus in Germany.

Mr. W. J. Potter.—We regret to learn of the death of Mr. W. J. Potter at the age of 77 years. Mr. Potter, who had been with W. T. Henley's Telegraph Works Co., Ltd., since May, 1887, when he was appointed town traveller, was on the company's staff continuously until March, 1932. On his retirement, however, he continued to hold his seat on the board, to which he was elected in 1913. He was a trustee of the Staff Pension Fund, and he acted as secretary of Henley's South African company from 1903 to 1914.

The late Mr. W. J. Potter

The funeral takes place at Golders Green Crematorium to-morrow, Saturday, at 12 noon, and it is requested that no flowers or wreaths shall be sent.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Isle of Arran Electric Light & Power Co., Ltd.—Private company. Registered March 11th. Capital, £20,000 in £1 shares (1,000 preference and 19,000 ordinary). Objects: To carry on the business of an electricity supply company in all its branches. The directors are: A. C. Heap, The Dial House, York Road, Cheam; A. C. Coubrough, Chantrey Wood Cottage, Witham, Essex; G. Laidler, Strabane, Brodrick; W. Ryley, Glenthorne, Weybridge; and V. J. Westlake, 3, Ullswater Road, N.14. Registered office: 34, Victoria Street, S.W.1.

"RA" Light, Ltd.—Private company. Registered March 11th. Capital, £5,000 in 1s. shares. Objects: To acquire from A. E. Batchelor the benefit of and goodwill in connection with the trade mark "RA," and to carry on the business of designers, manufacturers and suppliers of lamps and apparatus for lighting or heating in general, electrical engineers and contractors, &c. The subscribers are: Miss M. F. Bernhard, 9, Dancer Road, S.W.6, and Major H. G. L. Prynne, 16, Oakwood Court, W.14. Registered office: 73, St. Stephen's House, S.W.1.

Utilities (Manchester), Ltd.—Private company. Registered March 6th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a commission agent and factor of electrical and other appliances carried on at 128, Rusholme Road, Oxford Road, Manchester, by C. S. Jackson, as "Thor Electrical Appliances"; to manufacture and deal in domestic and other utilities, &c. The directors are: C. S. Jackson, Bryn Derwen, St. George's Road, Abergele, N. Wales; and W. E. Siebert, 51, Alexandra Park Road, N.10. Registered office: 128, Rusholme Road, Manchester.

Stanton, Leach, Ltd.—Private company. Registered March 4th. Capital, £500 in £1 share. Objects: To carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers of and dealers in radio and gramophone instruments and electrical fittings, &c. The subscribers are: L. Kransky and Phyllis E. Thomas, both of 17, Shaftesbury Avenue, W.1. Solicitors: Stanley Jarrett & Co., 17, Shaftesbury Avenue, W.1.

Maestro Products, Ltd.—Private company. Registered March 8th. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of radio sets and components and electrical equipment, &c. The subscribers are: Miss C. F. Ettridge, 50, The Avenue, Muswell Hill, N.10, and three others. Registered office: Brocket Works, Brocket Road, Hoddesdon, Herts.

Fay Radio & Recorders (1933), Ltd.—Private company. Registered March 7th. Capital, £4,000 in 3,000 preference shares of £1 and 20,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of home recording machines, electrical amplifiers, pick-ups, &c. The directors are: Delia Fay, 9, Roland Gardens, W.3; and P. D. Foley, Bowness, Oakfield Road, South Benfleet, Essex. Solicitors: Ashfield Rose & Co., 12, Henrietta Street, Strand, W.C.2.

Returns of Electrical Companies

Johnson & Phillips, Ltd.—Particulars have been filed of debenture stock to secure £400,000 authorised by resolution of December 22nd, 1932, and covered by trust deed dated February 20th, 1933, the whole amount being now issued. The stock constitutes a specific charge on freehold land and buildings, &c., in Charlton, Kidbrooke, and Greenwich, and a floating charge on the company's undertaking and other property, present and future, including uncalled capital. The trustees are the Prudential Assurance Co., Ltd. (The Prudential Assurance Co., Ltd., in consideration of the payment of £5,000, agreed to take up for cash at par so much of the debenture stock as was not taken up, either by way of conversion or for cash, by the debenture stock holders and shareholders of the company.)

Calcutta Tramways Co., Ltd.—Particulars have been filed of debenture stock to secure £250,000, and premium of two per cent., authorised January 24th, 1933, and covered by trust deed dated February 7th, 1933, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital (subject to indentures dated June 4th, 1901, and July 25th, 1922). Trustees: Beaver Trust, Ltd., 1, Queen Victoria Street, E.C.2. (The stock is issued at a discount to subscribers of two per cent.)

Christy Brothers & Co., Ltd.—Satisfaction in full on February 15th of mortgage dated June 24th, 1924, and registered July 14th, 1924, securing £1,000.

Young Accumulator Company (1929), Ltd.—Charge on land and building in the parish of Merton, dated February 14th, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Automatic Light Control, Ltd.—Debenture dated February 17th, to secure £11,250, and further advances, not exceeding in all £11,750, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Light Controlled Installations, Ltd., Copthall House, Copthall Avenue, E.C.2.

New Era Electrical Manufacturers, Ltd.—Capital, £100,000 in 50,000 preference and 50,000 ordinary shares of £1. Return dated December 31st, 1932. 1,504 shares taken up. £1,504 paid. Mortgages and charges, nil.

Consolidated Electrical Supplies, Ltd.—Capital, £100,000 in £1 shares. Return dated December 31st, 1932. 3 shares taken up. £3 paid. Mortgages and charges, nil.

Accurate Recording Instrument Co., Ltd.—C. E. Wakeling, 8, Serjeants Inn, E.C., was appointed receiver and manager on March 1st under powers contained in debentures dated April 4th, 1930, in place of C. G. Wareham.

W. H. A. Robertson & Co., Ltd.—Satisfaction in full on December 31st, 1932, of mortgage dated June 17th, 1926, and registered June 25th, 1926.

Lancashire Telephone Systems, Ltd.—Issues on July 27th, 1931, of £250, on October 1st, 1931, of £50, on December 30th, 1931, of £500, and on April 7th, 1932, of £250 debentures, parts of a series already registered. (Particulars of issues filed March 7th, 1933.)

Ionlite, Ltd.—Charge on hire-purchase agreements, totalling £4,352, dated February 27th, to secure all moneys due or to become due from the company to the chargees (F.V. Trust, Ltd., 6, Broad Street Place, E.C.).

Electric Supplies (Bloxwich), Ltd.—Capital, £5,000 in £1 shares. Return dated January 5th, 1933. 2,300 shares taken up. £1,558 paid. £742 considered as paid. Mortgages and charges, nil.

Grierson, Ltd.—Capital, £10,000 in 4,000 preference shares and 6,000 ordinary shares of £1. Return dated December 27th, 1932. 4,001 ordinary shares taken up. £4,001 paid. Mortgages and charges, nil.

Robinson & Hands Electric Co., Ltd.—Capital, £5,000 in 20 ordinary and 4,980 preference shares of £1 each. Return dated December 6th, 1932. 20 ordinary and 4,232 preference shares taken up. £4,252 paid. Mortgages and charges, nil.

Acton Battery Co., Ltd.—Issue on February 28th of £1,400 debentures, part of a series already registered.

J. Parkinson & Co. (Leeds), Ltd.—D. D. Perkins, 259, Roundhay Road, Leeds, ceased to act as receiver on March 1st.

City Notes

The County of London Electric Supply Co., Ltd., reports a balance of £1,559,521 for 1932, as compared with £1,397,687 in the preceding year; to this is added £464,370 brought in and interest charged to capital (Barking supply) of £48,937, making a total of £2,072,828 available. After deducting debenture interest, &c., and placing £466,619 to depreciation reserve, £33,500 to contingency fund, £25,000 to taxation reserve, and £250,000 to general reserve, it is proposed to pay interest at the rate of 5 per cent. per annum on instalments of the April, 1932, issue of ordinary shares, and a final dividend of 7½ per cent., on the 4,742,121 fully paid ordinary shares, making 10½ per cent. for the year (same), leaving £272,004 to be carried forward. The report states that the sales of electricity totalled 604,599,133 kWh, an increase of 95,070,219 kWh as compared with 1931. The number of consumers supplied directly or indirectly by the company shows an increase of over 48,000 and the total now exceeds 294,000. During February an additional amount of £500,000 of 5 per cent. debenture stock was sold on the market. An issue of 948,426 ordinary £1 shares was made and the ordinary share capital was further increased by an exchange of shares in respect of the acquisition of another undertaking. Substantial agreement has been arrived at in respect of the new standard prices fixed by the company; certain items in dispute have been referred to the Electricity Commissioners, whose decision has not yet been given. The Barking and Wandsworth stations are not yet operating as "selected" stations, as the Central Electricity Board has not commenced commercial operation in the South-East England area. The company has, however, certain temporary arrangements for affording supplies to the Board. The Maldon and District Electricity Special Order, 1932, has been approved by Parliament. Work on the extension of the Barking station, the capacity of which will be increased by a further 150,000 kW has proceeded satisfactorily; the new plant will be available to meet next winter's load. Satisfactory results have attended the inauguration of the schemes of assisted wiring, hire-purchase and hire of apparatus and new showrooms and branch offices have been opened at Streatham, Dunmow, Epping and Wallington. The transmission and distribution network was increased during the year by 372 miles of underground mains and overhead lines, while 117 transformer stations were put into commission. Supply is now available in about seventy districts in Essex, and further extensions are in hand. Meeting: March 21st.

The Enfield Cable Works, Ltd., held its annual meeeting on March 10th, the Earl of Verulam (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 3rd, p. 329), the chairman said that in spite of restrictions abroad which had made export business difficult, and the unwillingness of Corporations and other public bodies at home to incur any avoidable expenditure, their turnover in 1932 had only fallen by about 6 per cent. as compared with 1931, but towards the end of the year and during the current year to date there had been a further considerable fall in the volume of work. The rate of profit had come down, being based partly on the value of raw materials, but where they had been most hardly hit was in the stock value of raw materials, which had fallen in value by a substantial sum. The Enfield Rolling Mills, Ltd., was converted into a public company last autumn, its capital was increased to £500,000, and its business expanded to embrace certain special lines in copper, zinc and nickel manufacture. Enfield Cable Works (Australia), Ltd., had been handicapped by the currency restrictions in that country and by the slump, which had been as severely felt in Australia, perhaps, as anywhere else in the Empire. They had an ordinary share premium account and reserve totalling over £400,000, and they had ample cash resources. They could certainly finance any revival in trade that might come about in the next few months, and it seemed reasonable, therefore, to assume that they could afford to rely upon the reserves that had been built up without seeking to add to them. At the moment business was slack, but there did appear to be a more hopeful outlook in several quarters, and it was hoped also that before many months had passed they would begin to derive benefit from the expansion of the Enfield Rolling Mills business.

The Telegraph Construction & Maintenance Co., Ltd., held its annual meeting on March 9th. Mr. C. F. Campbell (chairman) presided, and in presenting the report and accounts (ELEC. REV., March 3rd, p. 329) said the making of drastic economies had been a painful and unpleasant affair, because it had included the discharge of men who had given the best years of their life to the service of the company. They had endeavoured to mitigate the necessary hardship involved as far as possible. The economy effected, from the point of view of the company, had been great, and it was only apparent to some extent in the accounts under review. The full effect of all the economies made would not come into operation until 1934. The amalgamation of the works had been carried out quickly at comparatively small cost. The necessary buildings at Greenwich had all been erected and it was expected that the machinery would be installed and ready for working shortly after Easter. The year 1932 was undoubtedly a poor one from the trading point of view, as orders were scarce and prices were low and the services of their large ship were only required for laying one cable. They were fortunate, however, in securing several small orders to keep their machinery running during a good many months of the year. With regard to the future, conditions were still difficult, but in their consolidated position at Greenwich, with their greatly reduced overheads, they were in a much more favourable position to compete for any business that might be obtainable. They were also busy exploring various avenues for business in directions other than that of submarine cables.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. reports that the net receipts for 1932 were £533,017, as compared with £438,997 in 1931. After deducting debenture interest, &c., there is a balance of £324,932. Dividends of 8 per cent. for the year on the "A" ordinary shares and 5 per cent. on the "B" ordinary shares are paid and the balance of £98,132 is placed to reserve appropriation account. After crediting this account with the premium on the issue of preference shares made during the year, and contributions in respect of new services, and adding £77,898 brought in, there is a balance of £268,189, of which £182,670 is placed to reserve and £85,519 carried forward. During the year approximately 354 miles of overhead mains and underground cables were put into service, making a total length of 1,527 miles. Supplies of electricity were made available in a number of districts in the counties covered by the company. The Radnor and Brecknockshire Electricity Special Order, 1932, was granted during the year, and the company also acquired the property of the Ross Electric Light & Power Co., Ltd. The report records the death of Mr. F. Massingberd Rogers, the appointment of Sir Bernard Greenwell, Bt., as chairman of the company, and the appointment of Messrs. A. W. Bolden and A. G. Hunt to the board. The last three gentlemen have since retired and Brig.-Gen. W. H. Hayes and Sir Holberry Mensforth have become directors, Sir Holberry being appointed chairman. Meeting: March 24th.

The Charing Cross Electricity Supply Co., Ltd., held its annual meeting on March 9th, Sir Francis Fladgate (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 3rd, page 329), the chairman said the slight decrease (about £3,000) in the revenue of the West End Undertakings was accounted for by alterations in rates made necessary on the renewal of certain large contracts. During the year they had sold over 5,250,000 kWh more than in 1931, and had added 8,313 kW to their total connections. They had now completed their d.c. sub-stations, and it would no longer be necessary either to add to their number or to increase their size. They anticipated that all future load would be dealt with on the a.c. system, which they were now laying down. They had considered the problem of changing over from d.c. to a.c., but had found it inadvisable. In view of the heavy proportion of power in their total supply they proposed to maintain a d.c. system indefinitely. Although they had bought nearly 4,000,000 kWh more from the London Power Co., the total cost had decreased by some £8,000, or 0.046d. per kWh. It was their intention to introduce a two-part tariff in the City area in substitution for the present flat rate for power.

The North-Eastern Electric Supply Co., Ltd., reports a profit for the year ended December 31st of £947,532, as compared with £857,865 in the preceding year. After deducting debenture interest, &c., and transferring £225,000 to special depreciation reserve and £55,000 to plant renewals reserve, and adding £71,240 brought in there is a total available of £503,403. It is proposed to pay a final ordinary dividend of 3½ per cent., making 6 per cent. for the year, and to carry forward £74,806. The Bill promoted by the company for the transfer of subsidiaries to it and for changing its title received the Royal Assent during the year. The share capital was increased to £8,760,000 by the creation of 660,000 additional ordinary shares of £1 each. Work in connection with the standardisation of frequency under the North-East England Electricity Scheme has proceeded satisfactorily. The new 50-cycle Dunston station was brought into commercial operation in January last, and good progress has been made in changing plant on consumers' premises. Meeting: Newcastle-upon-Tyne, March 21st.

The Kensington & Knightsbridge Electric Lighting Co., Ltd., held its annual meeting on March 9th, Col. R. E. Crompton (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 3rd, p. 329) the chairman said that the ordinary share capital had been increased by reason of the capitalisation of free reserves. The effect of the general trade depression was shown in the revenue account and the sales of electricity were only very slightly in excess of those in 1931.

The average price per kWh fell from 1.754d. to 1.696d. As 97 per cent. of the premises in the district were already connected to their mains, they had concentrated on developing the domestic load. Their charges for apparatus on hire had been reduced and a domestic two-part tariff had been introduced. New showrooms had been opened in Brompton Road, and the first results of this policy had been satisfactory, cookers on hire having increased during 1932 by 80 per cent., and water-heaters by 300 per cent., while the two-part tariff had been well received.

The City of London Electric Lighting Co., Ltd., reports a profit of £353,766 for the year ended December 31st, as compared with £350,860 in the preceding year, to which is added interest and dividends from investments, &c., making £362,856. After deducting debenture interest, &c., it is proposed to pay the balance dividend on the ordinary shares, making the standard dividend for the year, leaving £98,112. Of this £54,435 is placed to reserves and £43,679 transferred to the trustees of the employé co-partners' fund on account of their share of the "consumers' benefit." The sale of electricity during 1932 increased by approximately eleven million kWh, a record in the history of the company; the major part of this increase was sold to the Southwark Borough Council. Connections to the distributing system have also increased satisfactorily, but owing to the continued depression in business, consumption is abnormally low.

Lancashire Dynamo & Crypto, Ltd., reports a profit for 1932, after deducting depreciation and debenture interest, of £7,858, as compared with £5,391 in the preceding year, to which is added £7,802 brought in, making £15,660. It is proposed to pay an ordinary dividend of 2½ per cent., less tax (against 1¼ per cent.), and to carry forward £8,310. The report states that complete amalgamation with the Crypto Electrical Co., Ltd., was consummated during the year. The board again reports a continuance of depressed trade conditions during the period under review. In order to consolidate the company's position it has been decided to commence the manufacture of certain types of food machinery at the Willesden works. Meeting: March 21st.

The Newcastle & District Electric Lighting Co., Ltd., reports a gross profit for 1932 of £67,448 (against £67,252 in 1931), to which is added £15,323 brought in, making £82,771. After deducting debenture interest, &c., and transferring £21,000 to depreciation fund and £5,000 to general reserve, it is proposed to pay a dividend of 7 per cent. for the year and to carry forward £15,089. A Special Order for postponing the Newcastle Corporation's right of purchasing the company's undertaking from 1932 to 1937 was approved by the House of Commons in November. The capital has been increased to £600,000 by the creation of 150,000 new ordinary shares of £1 each, and these are being offered to the shareholders in proportion to their holdings. Meeting: March 24th.

The Llanelly & District Electric Supply Co., Ltd., held an extraordinary meeting on March 13th, at which resolutions were passed authorising an increase in capital to £1,200,000 by the creation of 550,000 £1 shares.

The subscription list was opened on Wednesday last for an issue of 250,000 ordinary shares of £1 each at 21s. 6d. The proceeds will be applied towards the redemption of the outstanding £293,340 five per cent. debenture stock. The balance required for this purpose and for the current capital requirements of the company will be provided by the sale of the 100,000 preference shares remaining unissued.

The Marconi International Marine Communication Co., Ltd., reports a profit for the year ended December 31st last of £168,693, as compared with £147,729 in the preceding year, to which is added £25,227 brought in making £193,920. As announced in our last issue, the final ordinary dividend is 2½ per cent., making 7½ per cent. for the year (against 10 per cent.). Taxation reserve receives £20,000 and general reserve £50,000, the amount carried forward being £33,045. The report records the death of Sir Charles J. Stewart, a director, and the retirement from the board, through ill-health, of Major H. Lefroy. Meeting: March 21st.

The Isle of Thanet Electric Supply Co., Ltd., held its annual meeting on March 10th, when Mr. A. R. Monks (chairman), who presided, said that the sales of electricity last year (4¾ million kWh), exceeded the total sold five years ago by nearly 50 per cent. New connections during the year under review totalled 726, and represented an increase of about 50 per cent. over the previous year's connections. To encourage domestic consumption a two-part tariff had been introduced and the question of a two-part tariff for business premises was being considered. There were still opportunities for substantial development.

The American Telephone & Telegraph Co. reports that for 1932 the total operating revenues decreased by $119,400,000, or 11 per cent. The net earnings were $194,400,000, a decline of $63,600,000 as compared with 1931. As the Western Electric Co. operated at a net loss of about $12,600,000, the net income of the system, including the Western Electric Co., was $58,000,000 less than dividends paid. The directors state that by January 1st, 1932, the company had accumulated a surplus amounting with its proportion of the surplus of its associated companies to $29 per share of its stock outstanding.

The Telephone & General Trust, Ltd., reports a net revenue for 1932 of £95,873, as compared with £84,548 in 1931, to which is added £30,292 brought forward, making £126,165. The preference and preferred ordinary dividends absorb £68,169, and it is proposed to pay a final ordinary dividend of 5 per cent., less tax, making 8 per cent. for the year, leaving £33,996 to be carried forward. Mr. A. S. Roger was appointed to the board in December last.

The Yorkshire (West Riding) Electric Tramways Co., Ltd., held its annual meeting on March 8th. Sir George E. Leon, Bt. (chairman), who presided, said the abandonment of the tramways and the substitution of motor-buses was now an accomplished fact. They estimated that the loss of capital assets they had sustained through the abandonment of the tramways was approximately £200,000.

The International Automatic Telephone Co., Ltd., reports a profit for 1932 of £134,653, as compared with £148,864 in 1931. A sum of £85,695 is brought in, making £220,348. The ordinary and deferred dividends are maintained at 10 per cent., but no bonus distribution is recommended (against 2½ per cent.). Reserve again receives £10,000, and £88,013 is carried forward. Meeting: April 6th.

The Fife Tramway, Light & Power Co. reports trading profits of subsidiaries, together with revenue from temporary investments, of £24,456. The net revenue of the parent company, including £3,723, brought in was £16,491. It is proposed to pay an ordinary dividend of 4 per cent. (against 3 per cent.), and to carry forward £1,572.

W. Canning & Co., Ltd., report a profit for 1932 of £48,960, to which is added £16,020 brought in, making £64,980. It is proposed to pay a final ordinary dividend of 7½ per cent., less tax, making 10 per cent. for the year, to pay a bonus of 1s. per share, less tax, and to carry forward £19,230.

British Insulated Cables, Ltd., reports a profit for 1932 of £589,000. Reserve and depreciation reserve receive £220,000, and it is proposed to pay a final ordinary dividend of 10 per cent., maintaining the distribution for the year at 15 per cent. The balance carried forward is £301,000.

The Mersey Power Co. reports a profit for 1932 of £66,671 (against £88,546 in 1931), and an amount brought forward of £14,199, making £80,870 available. It is proposed to pay an ordinary dividend of 4 per cent. (against 5 per cent.), to place £15,000 to depreciation reserve, and to carry forward £8,011. Meeting: Liverpool, March 21st.

Pinchin, Johnson & Co., Ltd., report a profit of £220,997 for 1932, as against £272,018 for 1931. To this is added £30,000 transferred from reserve and £65,736 brought in, making £316,733 available. The final ordinary dividend is 7½ per cent., making 15 per cent. for the year (against 17½ per cent.), and £47,053 is carried forward. Meeting: March 21st.

The Lancashire Electric Light & Power Co. has announced a final dividend on the ordinary shares of 4½ per cent., making 7 per cent. for the year.

The Midland Electric Corporation for Power Distribution, Ltd., has declared a final dividend of 5½ per cent., making 8 per cent. for the year (same).

The General Electric Co., Ltd., states that its issue of £3,500,000 4¼ per cent. first mortgage debenture stock was oversubscribed.

The Rangoon Electric Tramway & Supply Co. has announced a final dividend on the ordinary shares at the rate of 14 annas per share free of Indian tax.

The Chelsea Electricity Supply Co., Ltd., has declared a final ordinary dividend of 4 per cent., making the standard dividend of 7 per cent. for the year.

The Anglo-American Telegraph Co. is paying a quarterly dividend of ¾ per cent. on the ordinary stock and 1¼ per cent. on the preferred ordinary stock.

Ward & Goldstone, Ltd., have declared the usual final dividend on the cumulative preference shares at the rate of 7 per cent. per annum.

The Canadian General Electric Co., Ltd., is paying a quarterly dividend on the common stock of 2 per cent. (same).

Stocks and Shares

Tuesday Evening.

THE reopening of a number of the United States banks on the Monday in this week went some way towards encouraging the return of a confidence that had already begun to creep back after the shock of the financial crisis in New York ten days ago. The advent into office of the new President is welcome as having produced a man who, to speak colloquially, knows his job, and who is not afraid to ask for powers to carry it out. There has been a fairly general recovery in American stocks, including a rise of 7½ points in American Telephone & Telegraph. The crisis may be said to have passed. Barring accidents, there should be a gradual recovery in the direction of a more normal state of affairs, although to bring about this latter condition will prove a laborious, and probably a tedious, process. The other storm centre is Germany, where the outlook is more uncertain. What is going to happen in Germany and in Middle Europe continues to be a subject for anxious discussion. It has the result of forcing attention more and more to the purely safety first stocks, of which there seem to be very few in the world outside those comprised in the orbit of British securities. The plethora of capital and the stagnation in trade explain the widely spread desire on the part of the investor for such securities as shall enable him to sleep peacefully o' nights. For this reason the prices of shares in the Home electricity supply group remain at levels that seem to be distinctly high, but which bear favourable comparison with stocks in the purely gilt-edged and trustee lists.

London Passenger Stocks

London & Home Counties 4½ per cent. debenture stock, Central Electricity 4½ per cent. debenture, and others of the same character are holding their prices, these two at 108. It is thought that before long the area of such issues may be widened by the inclusion of London Passenger Transport stocks. As mentioned last week, it is expected that the probable starting point of the "B" stock will be about 113, and of the "C" between 55 and 60. The "A" stock is split into two classes, a 4½ per cent. and a 5 per cent. issue, and these will be allotted to holders of debenture stocks in

the various companies concerned, according to the basis of exchange already published.

In course of time the ordinary shares of the Underground Electric Railways Company will disappear altogether, each £100 being replaceable by £115 London Passenger "C" stock, together with an allotment of shares in a new company. On the idea that Metropolitan consolidated ordinary stock, which has special rights of its own, must be worth something like 70 on the basis of the present prices of gilt-edged securities, the stock has advanced to 69. Districts remain at 55½. The ordinary stock of this company will receive £92 10s. "C" London Passenger Transport when the distribution is made, similar terms being accorded to the ordinary stocks of the City & South London, London Electric Railway, and Central London Railway companies.

New Issues

Dealings have started this week in the new 4¼ per cent. first mortgage debenture stock offered by the General Electric Co., Ltd. This stock is in substitution of the 5 per cent. debenture stock that is being paid off. There was a good demand for the new issue, and business started on the basis of ⅜ premium. Llanelly and District Electric Supply Company opens its lists on Wednesday in this week for 250,000 ordinary shares of £1 each, offered at 21s. 6d. per share. The company recently sold 100,000 preference, and the money thus realised, together with that obtained from the new issue of ordinary shares, is to be used for repayment of the existing £298,000 5 per cent. debenture stock due to be redeemed on June 16th next. The prospectus points out that the dividend has advanced from 2½ per cent. for 1929 to 4¼ per cent. for 1932. Vickers is paying off 1¼ million pounds of 5 per cent. debentures, and has offered new 4 per cent. debenture in its stead. The price of the new stock is about 1 discount. The recently issued Lissen 8 per cent. preference shares, which were offered at 23s. and rapidly oversubscribed, are quoted at 1s. 3d. discount, the shares being 15s. paid. It is known that various industrial companies have in contemplation fresh issues of stock and shares.

Electricity Supply

The various annual reports which are now appearing from the companies which supply London with electricity make, as a whole, a satisfactory showing. One of the most important, the County of London, reports a net revenue for 1932 of over 1¼ million sterling, a gain of £180,000 on the year. Last year's revenue represents the high-water mark, so far attained, in the company's progress. At the Charing Cross Electric Company's meeting the chairman had a cheerful tale to tell in all respects except that relating to new assessments by the Corporation of London and the Westminster City Council. These cost the company £12,000 more than the amount absorbed by the same items in the previous year. Of the Scottish and Provincial companies, the Scottish Power has issued a report which speaks of satisfactory progress having been made in the construction of the Tummel development of the Grampian Company. Net revenue is again higher, and the shareholders receive their regular 8 per cent. dividend. The Isle of Thanet Electric runs tramways and motor bus services; in addition it looks after the electricity supply business. The transport branch produced less revenue last year, but the supply part of the undertaking provided the necessary corrective, and the company is going steadily ahead. The price of the ordinary shares is 21s. 3d., and the 6 per cent. participating preference stand at 27s. 6d. The Shropshire, Worcestershire and Staffordshire Electric Power Company reports an increase in the year's net revenue of £114,000, bringing the figure to £439,000. The company is controlled, of course, by Edmundson's Electricity Corporation. Shropshire preference are quoted at 27s., the 5 per cent. debenture stand at 112½.

Telegraph and Telephone

Small falls have occurred in the stocks of the Cables and Wireless group, the 5½ per cent. preference going back a point to 81¼. Anglo-American preferred is 2 points easier. The recovery in American Telephone & Telegraph has been already noted. International Telephone & Telegraphs strengthened to 10. Marconi Marines gave way sharply to 28s. 9d., showing a fall of 4s. 6d. upon a cut being made in the dividend, as mentioned last week (Electrical Review, page 365), to 7½ per cent., against 10 per cent. in the previous year. The reduction was unexpected, and caused disappointment. Two years ago the dividend was 15 per cent. Globe Telegraph & Trust are better at 12.

Manufacturing and Equipment

British Insulated, Callender's and Henley's show no change in their prices. Enfield Cable Works went back ½ to 4½, in spite of the company's maintenance of its dividend of 25 per cent. British Insulated is also repeating its previously paid 15 per cent. Preference shares in this section exhibit an improving tendency, there being small rises in Callender's and in General Electric preferences. English Electric shares are lower in both cases, the ordinary going back to 10s. 9d., the preference to 15s. Ever-Ready shares recovered to 26s. 9d. Crompton Parkinson ordinary are a trifle lower at 2?s. Telegraph Constructions hold their rise at 17s. 6d., holders being well satisfied with the chairman's speech at the sixty-ninth ordinary general meeting of the company held last week.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Mar. 14.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	72/6	—	4 2 8
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8⅞	8⅞	33/–	—	4 4 10
City of London	1	10	10	34/6	—	4 1 2
Clyde Valley	1	8	7	35/–	—	4 0 0
County of London	1	11	10½	52/–	+9d.	4 0 10
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	43/9	—	4 2 2
Elec. Supply Corporation	1	11	11	62/6	—	3 10 3
Kensington Ordinary	1	8	8	33/9	—	4 3 7
Lancs. Light and Power	1	6½	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	9	33/–	—	4 4 10
Metropolitan	1	10	10	49/6	–6d.	4 0 10
Midland Counties	1	7	7	35/–	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	29/0	—	4 2 9
Do. 7% Pref.	1	7	7	32/–	—	4 7 6
Northampton	1	10	10	50/–	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	30/–	+6d.	4 0 0
St. James' and Pall Mall	1	8	8	32/6	—	4 6 2
Scottish Power	1	8	8	35/9	—	4 9 5
South London	1	8½	8½	33/–	—	4 4 10
Urban Ordinary	1	7	7	37/6	+3/–	3 11
Westminster Ordinary	1	8½	8½	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	42/–	—	3 16 2
Home Rails.						
Central London Ord. Assented	Stock	4	4	81½	—	4 14 7
Metropolitan	„	3½	2½	69	+2	2 7 1
Do. District	„	5.	4½	55½	—	5 8 2
Underground Electric	1	8	7	17/0	—	5 6 0
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	150	+7½	6 0 0
Anglo-Am. Tel. Pref.	Stock	6	6	104	–2	5 15 5
Do. Pref.	„	1½	1½	25	—	6 0 0
Cables & Wireless 5½% Pref.	„	5½	2¼	81¼	–1	3 7 6
Do. A 7½% Ord.	„	—	Nil	26½	–½	—
Do. B Ord.	„	—	Nil	10½	–½	—
Globe Tel. and T. Ord.	10	8½	Nil	12	+½	—
Do. do. Pref.	10	6	6	11¼	—	5 1 2
Great Northern Tel.	10	20	20	27½	—	7 5 6
Marconi-Marine	1	15	10	28/9	–4/6	5 4 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	£	—	—	1/9	—	—
Do. do. 2nd Pref.	£	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	6	—	—
British Electric Traction Def. Ord.	„	5	5	235	—	—
Do. do. Pref. Ord.	„	8	8	136	—	5 17 8
Brazil Traction	100	—	—	9½	+½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	13/–	—	—
London United Tram Deb.	Stock	4	4	73½	—	5 8 10
Mexico Trams, 5% Bonds	—	5	5	41½	—	12 1 0
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	74½	—	6 14 3
Victoria Falls Ord.	1	15	15	4	—	3 15 0
Yorkshire (West Riding)	1	Nil	Nil	5/6	—	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/9	—	5 4 1
Babcock & Wilcox	1	14	14	38/–	+1/6	—
British Aluminium Ord.	1	10	5	25/–	—	4 0 0
British Insulated Ord.	1	15	15	67/6	—	4 8 4
Brush Ord.	Stock	5	Nil	50	—	—
Callender's	1	15	15	2½	—	5 4 4
Do. 6½% Pref.	1	6½	6½	28/9	+6d.	4 10 5
Crompton Parkinson Ord.	5/–	30	24	22/–	–6d.	5 1 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/–	—	—
Enfield Cable Ord.	1	25	25	4½	–½	5 11 1
English Electric	1	Nil	Nil	10/9	–6d.	—
Do. do. Pref.	1	Nil	Nil	15/–	–6d.	—
Ever Ready	5/–	35	35	26/9	+1/–	6 10 10
Ferranti Pref.	1	7	7	24/–	—	5 18 0
G.E.C. Pref.	1	6½	6½	29/9	+3d.	4 7 5
Do. Ord.	1	10	8	40/9	—	3 18 5
Henley's	1	30	30	6½	—	4 17 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	£1	Nil	Nil	17/6	—	—

* Dividends paid free of Income Tax.

Published Specifications

Expressly compiled for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1931

20094. "Electric motors." Warren Telechron Co. July 14th, 1930. (388020.)

21057. "Electrical indicating apparatus for directional compasses." Pioneer Instrument Co., Inc. July 24th, 1930. (388085.)

22591. "Electrical musical instruments." J. Compton Organ Co., Ltd., and L. E. A. Bourne. August 10th, 1931. (388036.)

22616. "Introduction of chemically active substances into vacuum tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 18th, 1930. (388046.)

22971. "Automatic regulator control for synchronous alternating-current machines running in parallel." British Thomson-Houston Co., Ltd., and C. Stewart. August 14th, 1931. (388024.)

22979. "Direct current commutator electric machines." B. C. Von Platen. August 18th, 1930. (388061.)

22992. "Electric batteries." H. C. Jenkins and Almeida Accumulators, Ltd. August 14th, 1931. (388026.)

22995. "Means of and apparatus for transmitting messages through submarine and other like cables." W. Estaugh. August 14th, 1931. (Addition to 233124 and 269637.) (388039.)

23030. "Apparatus for recording or reproducing sound films." Electrical Research Products, Inc. April 24th, 1931. (388040.)

23281. "Telephone repeaters or the like." Associated Telephone and Telegraph Co. September 2nd, 1930. (388065.)

23282. "Radio and other high-frequency circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., F. C. Lunnon, and H. J. H. Wassell. August 18th, 1931. (Addition to 351051.) (388066.)

23283. "High-frequency electrical oscillatory systems." Marconi's Wireless Telegraph Co., Ltd., E. Green, and F. G. Robb. August 18th, 1931. (388067.)

23287. "Submarine electric signalling cables." Electrical Research Products, Inc. August 18th, 1930. (388068.)

23288. "Electrodynamic devices for use in receiving or transmitting sound." Electrical Research Products, Inc. May 2nd, 1931. (Addition to 333578.) (388069.)

23347. "Television systems." Communication Patents, Inc. December 30th, 1930. (388071.)

23377. "Manœuvre signalling devices for road vehicles and the like." L. E. D. Berkeley. August 19th, 1931. (388075.)

23461. "Selector mechanism suitable for start-stop printing telegraph apparatus." Creed & Co., Ltd. (Teletype Corporation.) August 20th, 1931. (388077.)

23938. "Electric incandescent lamps or discharge tubes comprising a resistance which is placed in parallel with the filament." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 12th, 1930. (388088.)

24128. "Governing or regulating devices for power plant." J. W. Davison, E. M. Johnson, and Associated Electrical Industries, Ltd. August 27th, 1931. (388089.)

25434. "Squirrel-cage rotors for induction motors subjected to axial vibration." Siemens-Schuckertwercke Akt.-Ges. October 29th, 1930. (Patent of addition not granted.) (388100.)

27223. "Electrically-driven domestic apparatus." Elec. trolux, Ltd. October 16th, 1930. (388108.)

27778. "Protective gear for alternating-current electrical machinery." E. P. Hill, and Associated Electrical Industries, Ltd. October 6th, 1931. (388110.)

27895. "Sound-recording systems." Electrical Research Products, Inc., and C. R. Keith. June 27th, 1932. (388111.)

29993. "Thermally-operating electric switches." Allen West & Co., Ltd., and F. J. Pavitt. October 29th, 1931. (388119.)

30480. "Automatic volume control for wireless receivers." United American Bosch Corporation. January 24th, 1931. (388122.)

30828. "Gas-blast electric switches." International General Electric Co., Inc. November 6th, 1930. (388125.)

30930. "Electric devices comprising one or more gasfilled multiple anode discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 8th, 1930. (388126.)

31270. "Electric condensers." British Thomson-Houston Co., Ltd., and T. H. Kinman. November 11th, 1931. (388130.)

31705. "Snap action electrical switches." Simplex Conduits, Ltd., H. F. McLoughlin, and F. W. Osborn. November 16th, 1931. (388132.)

32303. "Electric contact devices." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. November 21st, 1931. (388136.)

33869. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. January 24th, 1931. (388151.)

1932.

281. "Selecting switches of the kind used in automatic telephone and like selective systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. January 5th, 1932. (388173.)

601. "Electric circuit breakers having arc-rupturing devices." Westinghouse Electric & Manufacturing Co. January 24th, 1931. (388175.)

637. "Electrically controlled ticket-issuing machines in or for totalisator systems." Siemens Bros. & Co., Ltd., J. H. Broome, and R. I. H. Clark. January 8th, 1932. (388176.)

1475. "Electric signalling systems." General Electric Co., Ltd., and F. C. F. Phillips. January 18th, 1932. (388179.)

2212. "Electric transformers." A. Zopp. January 25th, 1932. (388185.)

3497. "Method and apparatus for recording telephonic conversations." S. Isenberg. November 12th, 1931. (388195.)

3948. "Switch device for direction indicators for motor cars and the like vehicles." C. G. T. Salenius and A. V. Holm. February 10th, 1932. (388197.)

5839. "Modulated carrier wave signal transmitting and receiving systems." Marconi's Wireless Telegraph Co., Ltd. March 4th, 1931. (388213.)

7823. "Gaseous electron-discharge devices." Igranic Electric Co., Ltd. March 16th, 1931. (388223.)

8892. "Device for protecting the electrical heating resistances of apparatus for supplying by means of a fan heated air." F. O. Conill. June 1st, 1931. (388229.)

9689. "Radio receiving apparatus." I. Diaz. April 3rd, 1931. (388235.)

12248. "Electro-acoustic devices and diaphragms therefor." Electrical Research Products, Inc. February 12th, 1932. (388254.)

14757. "Coupling for electrical accumulators." C. de Nobili. May 27th, 1931. (388264.)

16477. "Sound producing devices." Marconi's Wireless Telegraph Co., Ltd. June 10th, 1931. (388269.)

17083. "Drives for weaving machines." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitäts Ges.). June 16th, 1932. (388271.)

17675. "Electric induction apparatus." British Thomson-Houston Co., Ltd. June 24th, 1931. (388276.)

19147. "Electric circuit breakers in which the arc is extinguished by a blast of fluid under pressure." Akt.-Ges. Brown, Boveri et Cie. July 6th, 1931. (388285.)

20320. "Thermionic amplifying arrangements." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 26th, 1932. (388292.)

21301. "Luminous electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 20th, 1931. (388302.)

21714. "Dynamo-electric machines." R. Bosch Akt.-Ges. September 28th, 1931. (388307.)

22000. "Apparatus for limiting the zones of action of single-phase superposed controlling-frequency currents between two star-star connected network sections." Landis & Gyr Akt.-Ges. August 14th, 1931. (388310.)

22317. "Electrically heated soldering irons." E. Sachs. August 9th, 1932. (388311.)

22403. "Electrical battery eliminators." Allgemeine Elektricitäts-Ges. August 13th, 1931. (388313.)

24139. "Thermally operated electrical switches." M. Payne and British Thermostat Co., Ltd. September 2nd, 1931. (Divided application on 24661/31.) (388326.)

1933

1793. "Loud speakers." General Electric Co., Ltd., and D. A. Oliver. October 26th, 1932. (Divided application on 3501/32.) (388348.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 8th:—

Tungwire. No. 537042. Class 5. Wire made of molybdenum, tantalum, or tungsten.—Tungwire, Ltd., 8, Francis Street, W.1.

Eros (lettering and design). No. 535894. Class 8. Dry batteries (not for medical purposes). Vee-Cee Dry Cell Co. (1927), Ltd., 2-4, Northwold Buildings, Northwold Road, Stoke Newington, N.16.

Berec—made in England (lettering and design). No. 537382. Class 8. Electric dry batteries, cells and accumulators (none of them being for medical purposes).—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Byranit. No. 530711. Class 13. Sparking plugs, electrical fittings to be used in connection with the ignition, starting and signalling systems of motor vehicles, etc.—Robert Bosch Gesellschaft, Stuttgart. (British representatives: W. P. Thompson & Co., 12, Church Street, Liverpool.)

Edibond. No. 534714. Class 13. Electric junction boxes and connecting, clamping, or earthing devices for electric cables.—Edison Swan Cables, Ltd., 123-125, Queen Victoria Street, E.C.4.

Ferham. No. 535386. Class 13. Electrodes of ordinary metal for use in electric welding.—Robert Jenkins & Co., Ltd., Masborough Boiler Works, Wortley Road, Rotherham, Yorks.

Torribar. No. 536995. Class 18. Electric cooking stoves, warming and boiling plates, and wash boilers.—Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.

Combating the Smoke Nuisance

THE winter issue of the Journal of the National Smoke Abatement Society discusses the possibility of legislation to eliminate smoke from domestic chimneys, if propaganda should fail to change public opinion. Though electricity and gas are used in a rapidly increasing number of houses there is only a very small fraction of the total which use no coal. Prohibition will be impracticable until substitutes can be provided at the same cost, but a reduction of the cleansing rate to householders using no coal would appear more feasible. Dr. H. A. Des Voeux (president) points out that the normal human being requires 5 lb. of food and drink per day but 35 lb. of air. Soot, which is composed of carbon and tar impregnated with sulphur causes catarrh and its consequences. It also blankets the health-giving sunrays. Ten per cent. of the deaths in this country are due to respiratory diseases and the rate in country districts is half the figure for big cities. The annual cost of smoke per person in New York has been estimated at £3 8s. and in Chicago £13.

The Society proposes to publish a reprint of John Evelyn's "Fumifugium" (with an introduction by Rose Macaulay), post-paid at 6d. (paper covers) and 1s. 6d. (stiff cloth cover). A previous edition of this work was reviewed in our issue of May 23rd, 1930, and was referred to in our leading columns of September 30th, 1932.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrow-in-Furness.—Wing, North Lonsdale Hospital, School Street; governors.

Bedford.—Houses (100), London Road Estate; borough engineer. Elementary school for E.C.

Berwick.—Renovation of parish church (£3,000); minister.

Bexley.—Cinema, Welling, with shops; C. Masey, architect, Caroline Street, Bedford Square, London, W.C.

Birmingham.—Branch library, Perry Common (£14,385), and extensions, Selly Oak Hospital (£3,000); city engineer. Majestic Hotel, Old Blue Coat School site, Colmore Row; Viscount Fielding.

Blackburn.—Extension and reorganisation of market hall (electrical work); borough engineer.

Blyth.—Church of St. Cuthbert's; Newcastle Diocesan Board of Finance, Pearl Buildings, Newcastle. Alterations, Municipal Buildings; L. Keeper, borough engineer.

Bradford.—Houses (114), Tong Street; E. Brooksbank.

Brierley Hill.—Houses (40); R. H. J. Comber, acting surveyor to U.D.C.

Burnley.—Alterations, Municipal Offices (£3,000); borough surveyor, Municipal Offices.

Cambridge.—Extensions, Addenbrooke's Hospital; clerk.

Cardiff.—Houses (200), Tremorfa Estate; city engineer.

Caterham.—Houses (79), Markfield Estate; F. W. Thomas.

Chelmsford.—Bazaar stores, High Street, for Marks & Spencer, Ltd.; Bovis, Ltd., builders, Upper Berkeley Street, London, W.

Chester.—Mineral water factory, Queen's Park Road; Thomas & Evans.

Chesterfield.—Houses (88), Newbold Road; J. H. Naylor & Son.

Clacton-on-Sea.—Church; secretary, St. Paul's Parochial Church Council.

Crewe.—Cinema; J. Parks & Son, builders, Northwich.

Cricklade.—Town hall; Baldwin Bros., builders, Fairford.

Crossens (SOUTHPORT).—Houses (158) for G. H. Ball.

Cuddington (SURREY).—Church for Baptist Trustees; Atkinson & Marler, 21, Maddox Street, London, W.

Dagenham (ESSEX).—Hotel, New Road; C. Day, Grays.

Deal.—Houses (138), Cemetery Road; surveyor.

Devonshire.—Secondary school, Bideford, for County E.C.; R. N. Armfelt, secretary, Exeter.

Doncaster.—School, Wheatley Park Estate; director of education.

Dudley.—Houses (214), Priory Estate (£60,594); H. Boot & Sons, Ltd.

Durham.—Houses (37), Low Pittington (£12,650); G. M. Pearson, builder, 49, Four Lane Ends, Hetton-le-Hole. Houses (66), Sherburn Road; W. J. Greene, city engineer, Town Hall.

Eccles.—Houses (100), Haddon Road; borough engineer. Alterations, Prince's Cinema, Monton; Monton Cinemas, Ltd.

Epsom.—Development of Ewell Court Estate; J. T. Overton.

Essex.—County High School for Boys (Ilford); T. Stuart, architect, County Hall, Chelmsford. School, Canvey Island (£5,968); Hosking & Son, builders. School extensions, Grays (£9,983); Brown Bros. (Grays), Ltd., builders. Practical instruction block (£2,880), Pitsea; F. E. J. Green & Sons, builders.

Fifeshire.—Town Hall, Pittenweem (£2,000); H. C. Mackintosh, joint town clerk.

Forfar.—Reconstruction of Glamis Parish Church (£2,700); minister.

Fort William.—Reconstruction of pier (£5,000); Mr. Leith, general manager, Messrs. MacBrayne, Glasgow.

Girvan.—Cinema (£6,000); W. H. Dickson.

Glasgow.—X-ray department for Royal Samaritan Hospital for Women; T. Macquaker, chairman of governors.

Goring-by-Sea.—Branch library; Worthing borough engineer.

Grimsby.—Houses (123); Hewins & Goodhand, builders, Eleanor Street.

Hanley.—Houses (56), Cobridge Road; Taylor, Shaw & Bromley.

Hastings.—Development of Broadway site; Davenport, Jones & Glenister. Additions to Hedlow Hotel, Eversfield Place; Jeffery & Bowcock, architects. Additions, Cavendish Place School; F. G. Watford, architect. Additions, Rocklands School, East Hill; Major A. H. Whitaker-Swinton.

High Wycombe.—Houses (45); borough surveyor.

Hull.—Church, new housing area; trustees, Methodist Church, Holderness Road.

Ilkeston.—Isolation Hospital; borough engineer.

Irish Free State.—(DRUMCONDRA, DUBLIN).—Houses (50), Whitehall, for the Post Office Utility Society, Ltd.; McDonnell, Dixon & Downes, architects, 20, Ely Place, Dublin. (KILLARNEY, Co. KERRY).—Additions, fever hospital, for the Board of Health; Winters & Buckley, architects and consulting engineers, 27, Molesworth Street, Dublin.

Isle of Wight.—Extensions, secondary school, Newport (£1,825), for E.C.

Leicester.—Furniture stores, Grandby Street and Charles Street, for Harris, Ltd. (£30,000); Symington, Price and Pike, architects, West Street.

Leigh (SURREY).—Telephone exchange; H.M. Office of Works.

London.—(ACTON).—Isolation hospital extension (£19,000); surveyor, Town Council. (EALING).—Cinema (2,500 seats), Broadway; J. Stanley Beard & Clare, Baker Street, W.1. (HAMMERSMITH).—Medical school, &c. (£172,500); L.C.C. architect. (KENSINGTON).—Flats, Phillimore Mews and Stafford Court; Morris Estates, Ltd. (LEYTON).—Shops, public library and offices, Church Lane and High Road, Leytonstone; J. Ambrose Dartnall, architect, 11, Dowgate Hill, Cannon Street, E.C.4. (PECKHAM).—Additions for S. Jones & Co., Peckham Grove; Bishop and Etherington-Smith. (SYDENHAM).—Extensions, including X-ray Department (£20,000), South-Eastern Children's Hospital; E. E. Dent, hon. secretary.

Macclesfield.—Houses (120); Kearton & Jones, builders, Congleton.

Manchester.—School, Victoria Avenue; Surveyor's Department, E.C. Offices, Deansgate.

Maryport (CUMBERLAND).—Cinema, Senhouse Street and High Street, for Graves Bros.; T. Nicholson, architect, Workington.

Middlesbrough.—Conversion of flats, Holgate Institution, into children's hospital; S. E. Burgess, borough engineer, Town Hall.

Newbiggin (NORTHUMBERLAND).—Houses (52); J. Kailofer, U.D.C. surveyor.

Newcastle-on-Tyne.—Houses (20), Crossway, Jesmond and Hadrian Roads; S. J. Stephenson, architect, 2, Saville Place. Factory, Bath Lane, for J. Sinclair, Ltd.; J. W. Taylor, architect, St. John Street. Shops and offices, Haymarket; T. Clements & Son, builders, Selbourne Gardens. Alterations to Jackson's premises, Clayton Street; P. L. Browne & Sons, architect, Pearl Buildings.

Newmarket.—Houses (54); M. J. Gleeson, Ltd., builders, 322, Chesterfield Road, Woodseats, Sheffield.

North Shields.—Houses near Hawkey's Lane; Cackett, Burns, Dick and MacKellar, architects, 21, Ellison Place, Newcastle.

Orpington (KENT).—Cinema, with electrical equipment, for A. Spencer May, Orpington Palace; Leslie Kemp & Tasker, architects.

Ossett.—Development of Ings Field Estate; Hepworth and Moorhouse.

Preston.—Extensions, including kitchen block, Sharoe Green Hospital; W. Platt, borough surveyor.

Prestwick (AYRSHIRE).—Houses (£14,000); G. Henderson, builder.

Princes Risborough (BUCKS).—Cinema, Regent Hall and Cinema Co., Ltd.; F. Longworth.

Prudhoe-on-Tyne.—Houses, Drawback Estate; J. Smith and W. E. Christer, builders.

Reigate.—Houses (30); Howell & Burgess, builders, Tolworth.

Retford.—Houses (60); borough surveyor.

Scarborough.—Alterations, Fairview Hotel, Alfred Street; Jones & Rickaby.

Sedgefield.—Houses (100), various sites; J. Stones, R.D.C. surveyor, Council Offices.

Shanklin (I.o.W).—Town hall and entertainment centre (£15,000); J. Rousell & Sons, builders, Ventnor.

South Shields.—Houses (64), Coleridge Avenue; Milton Swales, builder, Imeary Street. Houses (40), Harton Moor area; G. Bailey, Ltd., builders, King Street. Houses (100), Stanhope Road, for F. Buffham; T. A. Page & Sons, architects, 67, King Street. Houses; G. Thornton, builder, Morpeth Avenue. Extensions, Town Hall (£4,500); borough engineer. Buildings, High School; governors.

Stamford (LINCS).—Houses (32), New Cross Road site; borough engineer.

Stockport.—Houses (182), Bates Ley site; T. Davies & Son, builders.

Stockton-on-Tees.—Development of Brisbane Garden Estate for House & Garden Estate, Ltd., and school, Newnham Grange; G. P. Stainsby, architect. Reconstruction of the Hippodrome Theatre, Dovecot Street; A. McLeod, builders, 3, Westbury Street, Thornaby.

Stoke-on-Trent.—Houses (400), Abbey Hulton; Sutton Trustees.

Stretford.—Houses (20), Derbyshire Lane; E. & J. Slater.

Surrey.—School (384 places), Stoneleigh Estate, Cuddington, for E.C., and extensions, including electric lighting and central heating work (£120,000), Reigate Institution, for P.A.C.; clerk, Kingston-on-Thames.

Swansea.—Houses (118), Mayhill (£34,681); C. Sanson, Sketty.

Taunton (SOMERSET).—Extensions, maternity home, Canon Street; Samson & Colthurst, architects and surveyors, 1, Hammet Street.

Tonbridge.—Rebuilding station for Southern Railway Co., Ltd.; traffic manager, Cannon Street, London, E.C.

Torquay.—Houses (34), Barton Estate (£11,000); Coles and Squires, Honiton. Additions, Hotel Continental, Babbacombe Downs Road; T. F. Bouttens.

Wakefield.—Houses (28), Ashleigh Avenue; J. P. Firth. Houses (62), for aged, Gill Syke, and shops, Greenwood Road; city architect.

Wallsend.—Houses, Holy Cross and Battle Hill Estates; borough engineer.

Wardle.—Houses (30), Birch Road; A. Travis, architect, Union Bank Chambers, King Street, Rochdale.

Watford.—Rebuilding Palace Theatre; H. D. Wilson, manager.

Wednesbury.—Houses (172), Park Lane and Myvod Road; A. Wood, borough engineer, Town Hall.

West Riding.—Elementary school, Ward Green (electric lighting installations); H. Wormald, county architect, County Hall, Wakefield.

West Sussex.—Senior schools, Shoreham (£16,000); county architect, Chichester.

Whickham-on-Tyne.—Houses (32), various sites; T. Fenbow, U.D.C. surveyor, Council Offices.

Wolverhampton.—Houses (28), Victoria Road, Oxbarn; T. Wellings & Sons.

Worcester.—Houses (164); Housing, Ltd., builders, Blackheath, Birmingham.

Worthing.—Houses (39), near Church Walk; H. P. Brazier, architect. Flats, Wallace Avenue and Pevensey Road; Cole, Adams, Phillips & Cheriton. Bathing pool, &c., Beach House site (£60,680); borough engineer.

Wrexham.—Public abattoir (£10,000); borough architect.